019542

DEC 3 - 1991

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

UNITED STATES OF AMERICA, PLAINTIFF, V. ANDERSON, GREENWOOD & COMPANY ET AL., DEFENDANTS.	H-91-252 CIVIL ACTION NO. H-91-_____ H-91-3529

CONSENT DECREE


153268

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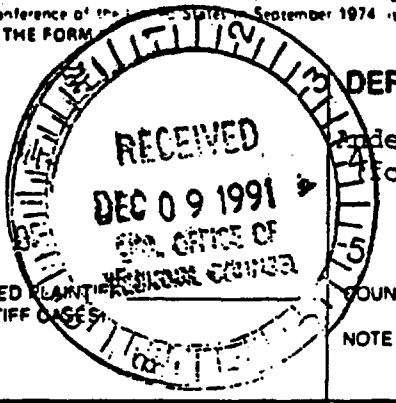
01-0543

CIVIL COVER SHEET

The JS-44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)



I (a) PLAINTIFFS

United States of America

DEFENDANTS

Anderson, Greenwood & Co., (for Keystone), et. al.

H-91-3503

(b) COUNTY OF RESIDENCE OF FIRST LISTED PLAINTIFF _____ (EXCEPT IN U.S. PLAINTIFF CASES)

COUNTY OF RESIDENCE OF FIRST LISTED DEFENDANT _____ (IN U.S. PLAINTIFF CASES ONLY)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED

(c) ATTORNEYS (FIRM NAME, ADDRESS, AND TELEPHONE NUMBER)

United States Department of Justice
Environmental Enforcement Section
P. O. Box 7611
Washington, DC 20530 Tele. (202)514-1134
Attn: Beverlee J. DeStein, Trial Attorney

ATTORNEYS (IF KNOWN) Mark J. White
Baker & Botts
S.D. Id No. 6130
1600 San Jacinto Boulevard
Austin, Texas 78701
(512) 322-2560

II. BASIS OF JURISDICTION (PLACE AN "X" IN ONE BOX ONLY.)

- X 1 U.S. Government Plaintiff
- ☐ 2 U.S. Government Defendant
- ☐ 3 Federal Question (U.S. Government Not a Party)
- ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (PLACE AN "X" IN ONE BOX FOR PLAINTIFF AND ONE BOX FOR DEFENDANT)

(For Diversity Cases Only)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated or Principal Place of Business in This State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated and Principal Place of Business in Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. CAUSE OF ACTION (CITE THE U.S. CIVIL STATUTE UNDER WHICH YOU ARE FILING AND WRITE A BRIEF STATEMENT OF CAUSE)

DO NOT CITE JURISDICTIONAL STATUTES UNLESS DIVERSITY. The Comprehensive Environmental Response, Compensation and Liabilit Act ("CERCLA"), 42 U.S.C. Sections 9601 et seq. The Complaint seeks injunctive relief to abate actual or threatened releases of hazardous substances from a facility located near Hempstead, Texas, and recovery of response costs incurred by the United States.

V. NATURE OF SUIT (PLACE AN "X" IN ONE BOX ONLY)

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability

REAL PROPERTY
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- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS

PERSONAL INJURY
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- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
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- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury

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- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

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- ☐ 444 Welfare
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FORFEITURE/PENALTY
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- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs
- ☐ 660 Occupational Safety/Health
- ☐ 690 Other

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- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt. Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ret. Inc. Security Act

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- ☐ 423 Withdrawal 28 USC 157

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- ☐ 830 Patent
- ☐ 840 Trademark

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- ☐ 862 Black Lung (923)
- ☐ 863 DIWC (405(g))
- ☐ 863 DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

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- ☐ 871 IRS—Third Party 26 USC 7609

OTHER STATUTES
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- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce/ICC Rates etc.
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
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- ☐ 850 Securities/Commodities Exchange
- ☐ 875 Customer Challenge 12 USC 3410
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VI. ORIGIN (PLACE AN "X" IN ONE BOX ONLY)

X 1 Original Proceeding | ☐ 2 Removed from State Court | ☐ 3 Remanded from Appellate Court | ☐ 4 Reinstated or Reopened | ☐ 5 Transferred from another district (specify) | ☐ 6 Multidistrict Litigation | ☐ 7 Appeal to District Judge from Magistrate Judgment

VII. REQUESTED IN COMPLAINT:

CHECK IF THIS IS A CLASS ACTION ☐ UNDER F.R.C.P. 23

DEMAND $

Check YES only if demanded in complaint.

JURY DEMAND: ☐ YES X NO

VIII. RELATED CASE(S) IF ANY (See instructions)

JUDGE Rainey DOCKET NUMBER H-90-665

DATE 12/3/91

SIGNATURE OF ATTORNEY OF RECORD

Beverlee J. DeStein

UNITED STATES DISTRICT COURT

December 3, 1991

Groundwater

Sheridan Consent Decree

019545

IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF TEXAS

UNITED STATES OF AMERICA	§	
	§	
PLAINTIFF,	§	
	§	
VS.	§	CIVIL ACTION NO.
	§	
DEFENDANTS.	§	

CONSENT DECREE

The United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA") has filed a complaint ("Complaint") pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended ("CERCLA"), 42 U.S.C. §§ 9606, 9607, for the abatement or cost of abatement of any release or threat of release of hazardous substances from a facility known as the Sheridan Disposal Services Site ("Site"), located on a cut bank above the Brazos River ("River"), approximately nine miles north-northwest of the City of Hempstead, Waller County, Texas.

The Complaint alleges that the defendants ("Settlors") named in the complaint are persons within the meaning of CERCLA and seeks: (1) to impose liability for the abatement of the release or threatened release of hazardous substances at or from the Site that would pose an endangerment to public health and the environment; (2) recovery of response costs, pursuant to Section 107 of CERCLA, 42 U.S.C. § 9607, incurred by the United States and (3) a declaratory judgment for recovery of future response costs incurred by the United States pursuant to Section 107.

The Settlors deny any and all legal or equitable liability under any federal or state statute, regulation, ordinance or common law arising out of the transactions and occurrences alleged in the Complaint.

Pursuant to CERCLA Section 122, 42 U.S.C. § 9622, the United States and the Settlors each stipulate and agree to the making and entry of this Consent Decree ("Decree") prior to the taking of any testimony, based upon the pleadings herein, and without any admission of liability or fault as to any allegation or matter arising out of the pleadings of any party or otherwise.

Each undersigned representative of the Settlors certifies that he or she is fully authorized to enter into the terms and conditions of this Decree and to execute and legally bind such party to this document.

The undersigned representatives of the United States certify that they are collectively fully authorized to enter into the terms and conditions of this Decree and to execute and legally bind the United States to this document.

NOW, THEREFORE, without trial, adjudication, or admission of any issue of law, fact, liability, or responsibility by Settlors, and without the Decree being admissible as evidence in any proceeding except in a proceeding to enforce the terms of this Decree or as otherwise specifically provided in this Decree, it is hereby ORDERED, ADJUDGED, AND DECREED THAT:

I. JURISDICTION

The Court has jurisdiction over this matter and the Parties. The Parties agree not to contest the jurisdiction of the Court to enter this Decree or in any subsequent action by the Parties to enforce, modify, or terminate it. The Complaint states a cause of action upon which, if the allegations were proven, relief can be granted.

II. PARTIES

The parties to this Decree are the United States of America on behalf of the United States Environmental Protection Agency and the Settlors.

III. STATEMENT OF PURPOSE

The purpose of this Decree is to: (a) protect human health and the environment from the release or threatened release of hazardous substances at or from the Site; (b) fund and implement the Ground Water Remedial Action; and (c) resolve the claims by the United States against the Settlors for the Ground Water Operable Unit.

IV. SITE HISTORY

Sheridan Disposal Services, Inc., operated a commercial waste disposal facility at what is now known as the Sheridan Site from about 1958 to 1984. A wide variety of hazardous substances, including organic and inorganic chemicals and solid wastes were disposed of at the Site. The facility treated waste by steam distillation, open burning and incineration. A lagoon or pond area was developed in a low-lying area of the Site that was used as a holding pond and for disposal of overflow wastes and waste treatment residues. In 1976, the facility initiated use of an evaporation system for disposal of water accumulated in the pond area.

The Sheridan Site was proposed for listing on the National Priorities List in June 1986. At that time a group of companies identified by the EPA as potentially responsible parties had already formed the Sheridan Site Committee and were working cooperatively with the State in investigating site conditions and possible remedial alternatives. Those activities were continued under a formal administrative order on consent which was entered in February 1987. Pursuant to that order, the Sheridan Site Committee performed, with EPA oversight, both a source control and a ground water remedial investigation and feasibility study to investigate existing conditions at the Site and to evaluate possible remedial alternatives. This Decree addresses the Ground Water Operable Unit only; a separate Decree addresses the Source Control Operable Unit.

The remedial investigation included a study of site conditions, both surface and subsurface. Extensive field work was performed with EPA oversight. Sample and laboratory analyses of site materials were carried out in EPA approved laboratories.

During performance of those studies, a community relations plan was implemented to advise the community of the status of activities at the Site through newsletters, public meetings and maintenance of public document repositories.

The final remedial investigation for the Ground Water Operable Unit was issued on December 30, 1988. The feasibility study for the Ground Water Operable Unit was completed and placed in the public repositories on July 28, 1989.

On July 31, 1989, EPA announced that these studies were completed and that public comments were being accepted on the range of alternatives for the Ground Water Operable Unit discussed in the feasibility study. EPA's public notice stated its preference for the natural attenuation alternative. No public comments were received during the public comment period.

On September 27, 1989, the Record of Decision ("ROD") for the Ground Water Operable Unit was issued for the Site. The ROD selected the natural attenuation [illegible].

V. BINDING EFFECT

This Decree applies to and is binding upon the Parties, and their parents, successors, and assigns. Any change in ownership or corporate status of a Settlor shall in no way alter such Settlor's obligations under this Decree. The Settlors shall provide a copy of this Decree, as entered, with all appropriate and relevant attachments and appendices, to each person, including all contractors and subcontractors, retained to perform the work contemplated herein and shall condition any contract for performance of all or any part of the Remedial Action on compliance with this Decree. The Settlors and those persons in active concert or participation with them who receive actual notice of this Decree agree not to interfere with or impede the implementation of this Decree.

VI. DEFINITIONS

The principal terms used herein are defined as follows:

Attachment A: Record of Decision.

Attachment B: Statement of Work.

Attachment C: List of Settlors (Group A and Group B Settlors).

Attachment D: Sheridan Site Legal Description.

CERCLA: The Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613 (1986).

Certification of Completion: The certification provided by EPA pursuant to Section 122 of CERCLA upon its approval of the completion of the work required by this Decree.

Contaminants: Any solid waste, hazardous waste, hazardous substance, pollutant, chemical, or radioactive material as defined at 42 U.S.C. § 9601(33).

Contractor: The company or companies retained on behalf of the Settlors to undertake and complete the Remedial Action.

Costs: All oversight, administrative, enforcement, and response costs, direct or indirect, incurred or to be incurred by the United States, EPA and DOI relative to Ground Water Operable Unit activities at the Site.

DOI: United States Department of Justice.

EPA: The United States Environmental Protection Agency.

Future Liability: Any and all civil liability or other civil obligation under CERCLA Sections 106 and 107 that arises after the Certification of Completion with regard to the Ground Water Operable Unit at the Site.

Ground Water Operable Unit: That portion of the response activity at the Site which addresses risks associated with the contamination to ground water that is described in the ROD for the Ground Water Operable Unit dated September 27, 1989.

Ground Water Remedial Action: The implementation, in accordance with this Decree, of the remedy selected by EPA for the Ground Water Operable Unit as described in the ROD.

Group A Settlors: Those Settlors who have the responsibility to finance and perform the Ground Water Remedial Action pursuant to this Consent Decree.

Group B Settlors: Those Settlors who only have responsibility for payments to the Sheridan Site Trust in the amounts stated in Attachment C.

Initiation of Work: The beginning of work on each phase of Ground Water Remedial Action as defined in the schedule and/or work plan governing that phase of the work to be performed.

NCP: The National Oil and Hazardous Substance Pollution Contingency Plan, 40 C.F.R. Part 300, as amended.

NPL: The National Priorities List, 40 C.F.R. Part 300, App. B.

Oversight: The United States' inspection of remedial work and verification of adequacy of performance of activities and reports of the Settlors as required under the terms of this Decree, directly or through its representatives, including any necessary support work.

Owner-Settlor: One or more Settlors who are the owners of the site.

Parties: The United States and the Settlors.

Project Coordinator: As to EPA, the individual designated to oversee implementation of this Decree and to coordinate communications with the Settlors; and as to the Settlors, the individual authorized to act on their behalf to ensure performance of the Remedial Action in compliance with this Decree.

RAS. CLP: Routine Analytical Services, Contract Laboratory Program, as set forth in EPA's Users Guide to the Contract Laboratory Program, OSWER No. 9240.0-1 (Dec. 1988).

Record of Decision or ROD: The document signed by the EPA Region VI Regional Administrator on September 27, 1989, which describes the activities to be conducted at the Site for the Ground Water Remedial Action. (Attachment A hereto).

RI/FS: The Remedial Investigation and Feasibility Study formally approved by EPA for the Ground Water Operable Unit.

SAS, CLP: Special Analytical Services, Contract Laboratory Program, as set forth in EPA's Users Guide to the Contract Laboratory Program, OSWER No. 9240.0-1 (Dec. 1988).

Settlors: Those defendants named in the Complaint who are signatories to this Decree (listed in Attachment C hereto), their parents, subsidiaries, successors and assigns.

Sheridan Site or Site: A "facility" as defined in Section 101(9) of CERCLA, 42 U.S.C. § 9601(9), that has been listed on the NPL and more particularly described in Attachment D to this Consent Decree.

Sheridan Site Trust Fund: The fund managed by the Trustee(s) into which the Settlors shall contribute in order to fund the Ground Water Remedial Action.

Site Remediation: That phase of the Ground Water Remedial Action in which the action set forth in the ROD and the SOW takes place at the Site.

Site Representative: As to EPA, those persons confirmed by the EPA Project Coordinator as authorized to conduct oversight activities pursuant to this Decree; and as to Settlors, those contractors and subcontractors hired in connection with the Remedial Action.

State: The State of Texas.

Statement of Work or SOW: The Statement of Work (Attachment B hereto) which sets forth the general plan for carrying out the Ground Water Remedial Action.

Superfund: The Hazardous Substances Superfund, 42 U.S.C. § 9631(a).

VII. OBLIGATIONS FOR THE REMEDIAL ACTION

A. The Settlors shall finance and perform the Ground Water Remedial Action described in the ROD in accordance with the NCP and with the standards, specifications, and schedule of completion set forth in or approved by EPA pursuant to Section VIII, herein. All actions taken by the Settlors which are in accordance with this Decree shall, upon approval of EPA, be deemed to be consistent with the NCP.

B. Pursuant to section 122(d) of CERCLA, all actions undertaken by the Group A Settlors pursuant to this Decree shall be undertaken in accordance with the requirements of all "applicable" or "relevant and appropriate" state and federal laws and regulations that are specified in the ROD. Pursuant to CERCLA and the NCP, no federal, state or local permits are necessary for the onsite work conducted pursuant to the ROD. The United States has determined that the obligations and procedures authorized under this Decree are consistent with its authority under applicable law.

C. In the event EPA determines that the Group A Settlors have failed to implement the Ground Water Remedial Action in accordance with this Decree, the EPA may perform the remainder or any phase of the Ground Water Remedial Action. Prior to such performance, the EPA will provide the Group A Settlors with thirty (30) days advance notice of its intent to do so and the basis for its determination. If the Group A Settlors disagree with the EPA's determination, the Group A Settlors must, within thirty (30) days of the notice, invoke the

Dispute Resolution provisions of this Decree. Following resolution of any dispute under this Section, if the EPA is successful and assumes performance of the remainder or any phase of the Ground Water Remedial Action, any liability of the Group A Settlors for stipulated penalties arising from the acts or omissions that prompted the EPA's performance of Remedial Action shall continue to accrue for a maximum of thirty (30) days from the date of receipt of EPA's notice of intent to perform the remainder or any phase of the Ground Water Remedial Action. In consideration for the cessation of stipulated penalty accrual, the Group A Settlors shall pay an additional penalty of $200,000 in liquidation of future accrual of penalties, if the EPA performs the remainder or any phase of the Ground Water Remedial Action. If EPA performs the remainder or any phase of the Ground Water Remedial Action because of the Group A Settlors' failure to comply with their obligations under this Decree, the Group A Settlors shall reimburse the United States for the costs of doing such work in accordance with Section XX within sixty (60) days of receipt of demand for payment. The United States shall make available upon written request the cost documentation which it maintains pursuant to its current cost documentation procedures. At present, those procedures are set forth in the Financial Management Procedures for Documenting Superfund Costs, September 1986, at pp. III 21-24.

D. Any reports, plans, specifications, schedules, and/or appendices, required by this Decree are, upon approval by EPA, incorporated into this Decree, and any noncompliance with such approved report, plan, specification, schedule, or appendices shall be subject to the stipulated penalty provisions set forth in Section XXV of this Decree.

E. Nothing in this Section shall prevent Group A Settlors from asserting in a dispute over costs that the EPA costs were incurred inconsistent with the NCP. Nothing in this Section

requires Group A Settlors to reimburse the United States for costs incurred for actions inconsistent with the NCP.

VIII. WORK TO BE PERFORMED

A. General Work. The Group A Settlors shall conduct the Ground Water Remedial Action or shall select one or more qualified contractors to conduct the Ground Water Remedial Action. The Group A Settlors and/or their contractors shall perform the Ground Water Remedial Action in accordance with the Statement of Work and approved plans, reports and schedules.

B. Contractor Selection. For all contractor(s) selected to perform work pursuant to this Decree, Group A Settlors shall obtain a certification from such contractor(s) that said contractor(s) is properly authorized and/or licensed to perform work in Texas.

C. Ground Water Remedial Action Work. The Ground Water Remedial Action work shall consist of: (1) development of ground and surface water sampling workplan; (2) implementation of ground and surface water sampling program; (3) implementation of institutional controls; and (4) implementation of the remedial action plan in the case that alternative concentration limits (ACLs) are exceeded.

1. Ground Water and Surface Water Sampling Workplan.

a. Within ninety (90) days of approval of the Source Control Site Remediation Report, the Group A Settlors shall submit to EPA a draft Ground Water and Surface Water Sampling Workplan which shall contain (1) detailed description of all pre-sampling, sampling and post-sampling activities; (2) schedule for implementation of Ground Water Remedial Action; (3) report format and contents; (4) a Health and Safety Plan; (5) a Quality Assurance/Quality Control Plan; (6) a Spill/Release Contingency Plan; and (7) a Community

Relations Plan. To the maximum extent feasible the Group A Settlors shall utilize the plans developed for the Source Control Remedial Action.

b. Within thirty (30) days of receipt of the draft Ground and Surface Water Sampling Workplan, EPA will provide comments to Group A Settlors.

c. Within thirty (30) days of receipt of EPA's comments, Group A Settlors shall submit a final Ground and Surface Water Sampling Workplan which addresses each comment.

d. Within thirty (30) days of receipt of the final Ground and Surface Water Sampling Workplan, EPA will notify Group A Settlors of its approval/disapproval with comments.

e. Within twenty (20) days of receipt of any disapproval, Group A Settlors shall resubmit the final Ground and Surface Water Sampling Workplan addressing each comment.

f. Within twenty (20) days of receipt of the resubmitted final Ground and Surface Water Sampling Workplan, EPA will notify the Group A Settlors of its approval/disapproval.

2. Implementation of Ground and Surface Water Sampling Program.

a. The Group A Settlors shall implement the Ground and Surface Water Sampling activity in accordance with the schedule included in the approved Ground and Surface Water Sampling Workplan.

3. Institutional Controls.

From the effective date of this Decree until its termination, the Group A Settlors shall maintain in effect the institutional controls required by the RODs for the Source Control Operable Unit and the Ground Water Operable Unit.

4. Remedial Action Plan Development.

a. If during a scheduled sampling activity the analytical results indicate a constituent in the ground water has exceeded the trigger level concentrations listed in Table 2-3 in the Statement of Work (Attachment B) that well will be resampled for that constituent to confirm the initial results.

b. If the second constituent sample also exceeds the trigger level concentration, the well will be sampled for that constituent for four consecutive quarters. If the concentration stabilizes, the sampling frequency for that well will resume the normal schedule. If the concentration shows an increase, the sampling will continue on a quarterly frequency until such time as the concentration stabilizes for four consecutive quarters or the concentration exceeds the value listed in Table 4-1 in the Statement of Work (Attachment B). If the concentration stabilizes, the sampling frequency will resume the normal schedule; but if the concentration exceeds the Table 4-1 (SOW) value, the Group A Settlors shall prepare a Remedial Action Plan.

c. The sampling frequency of a particular well will be modified if a graphical analysis of the change in constituent concentration with time shows that 80% of the ACL value could be reached prior to the next scheduled sampling event. This well will then be sampled for that constituent to coincide with the time when the trigger level (Table 2-3, SOW)

could be reached. If sampling results indicate that any trigger levels have been exceeded, quarterly sampling will be initiated as described above.

d. If during any sampling event the analytical results indicate a constituent in the ground water has exceeded the concentration values listed in Table 4-1 in the Statement of Work (Attachment B), that well will be resampled within 20 days from Settlors' receipt of data for that constituent to confirm the initial results. If the second sample also exceeds the value listed in Table 4-1 in the Statement of Work (Attachment B), the Group A Settlors will prepare a Remedial Action Plan.

e. Within ninety (90) days of receipt of the confirming constituent analysis which verifies exceedance of a Table 4-1 value, the Group A Settlors will submit to EPA a draft Remedial Action Plan evaluating alternatives and recommending such additional response action as may be necessary to assure that ACL values are not exceeded in the shallow Ground Water.

f. EPA will approve, disapprove, or modify with comments the Remedial Action Plan.

g. If ACL concentrations are exceeded and additional response action is required by EPA, subject to applicable public participation requirements of CERCLA, the Group A Settlors shall initiate and complete the response actions required by the approved Remedial Action Plan in accordance with an approved schedule contained within that plan.

D. Document Review and Approval.

The provisions of this Section which require Group A Settlors to address EPA comments shall require Group A Settlors to address such comments to EPA's satisfaction;

provided however, that EPA's approval of any submittal shall not be withheld in a manner that is arbitrary and capricious, or otherwise not in accordance with law. Any document resubmitted to EPA with any changes shall be submitted with the changes clearly marked. Upon approval, Group A Settlors shall submit two unmarked copies of the final documents to the EPA and one unmarked copy to the DOJ.

IX. PROJECT COORDINATOR

A. Not later than the effective date of this Decree, EPA and the Group A Settlors shall each appoint a Project Coordinator who shall be responsible for overseeing the implementation of the Decree and for coordinating communication among the Parties and their contractors. Absence of either Project Coordinator from the Site shall not be cause for stoppage of work.

B. The Group A Settlors' Project Coordinator shall be the individual appointed by the Group A Settlors to act on their behalf as site representative for oversight of performance of daily operations during implementation of the Ground Water Remedial Action, and to ensure performance of the Ground Water Remedial Action in compliance with this Decree. All work performed pursuant to this Decree by the Group A Settlors shall be under the direction and supervision of the Group A Settlors' Project Coordinator who shall be a qualified professional engineer or a person otherwise qualified to conduct the activities to be performed.

C. The EPA Project Coordinator shall have the authority vested in the Remedial Project Manager and the On-Scene Coordinator by the NCP as well as the authority to ensure that the Remedial Action is performed in accordance with all applicable statutes, regulations and this Decree. The EPA Project Coordinator further has the authority to require a cessation of the performance of the Ground Water Remedial Action or any other activity at the Site that, in his

or her opinion, may present or contribute to an imminent and substantial endangerment to human health, or the environment because of an actual or threatened release of hazardous substance from the Site.

D. If the Ground Water Remedial Action is delayed under order of the EPA Project Coordinator, the Schedule for Completion set forth in this Decree shall be extended to cover the period of time equal to the time of the suspension of the Ground Water Remedial Action plus reasonable additional time for resumption of activities. If an imminent and substantial endangerment described in paragraph C above is caused by Group A Settlors' non-compliance with the terms of this Decree, then any extension of the compliance deadlines shall be at EPA's sole discretion.

E. Without affecting the Notice section herein, to the maximum extent feasible, communications and the transmission of documents between EPA and the Group A Settlors shall be made or directed through the Project Coordinators of the respective parties. Meetings shall be scheduled and held in accordance with the provisions of Section VIII above.

F. The EPA and the Group A Settlors may change their respective Project Coordinators. Such a change shall be accomplished by notifying the other party in writing at least seven (7) days prior to the change when possible. The Project Coordinators may delegate on a temporary basis his or her responsibilities and shall notify the other party's Project Coordinator orally or in writing of such delegation.

G. The respective EPA and Group A Settlors' Project Coordinators may assign other representatives, including other employees or contractors, to serve as a Site Representative for oversight of performance of daily operations during the Ground Water Remedial Action.

H. Prior to invoking Dispute Resolution procedures, any dispute arising between an EPA site representative and Group A Settlors or their contractors which cannot be resolved, shall be referred to the Project Coordinators.

I. Neither the Project Coordinators nor the Site Representatives has the authority to modify in any way the terms of this Decree. However, the EPA Project Coordinator may make decisions concerning whether field activities are in compliance with this Decree, and such determinations shall be documented in writing.

J. The Project Coordinators may, by written agreement, change the schedules for work to be performed. Such changes shall not be considered modifications to this Decree.

X. HEALTH & SAFETY PLAN

A. The Group A Settlors shall submit to EPA a Health and Safety Plan in accordance with the schedule in Section VIII.

B. The Health and Safety Plan shall satisfy the requirements of the Occupational Safety and Health Guidance for Hazardous Waste Site Activities.

C. All persons on Site shall comply with the Health and Safety Plan, except that EPA employees, representatives, and contractors shall comply with EPA's health and safety provisions.

XI. QUALITY ASSURANCE/QUALITY CONTROL

A. The Group A Settlors shall submit to the EPA for approval in accordance with the schedule in Section VIII herein, a Quality Assurance/Quality Control (QA/QC) Plan for all phases of the Ground Water Remedial Action. The QA/QC Plan shall be prepared in accordance with current EPA guidance including, but not limited to, "Interim Guidelines and Specifications

for Preparing Quality Assurance Project Plans (QAMS-005/80)". The United States will submit copies of current EPA guidance documents to Group A Settlors upon request.

B. The Group A Settlors shall use QA/QC procedures in accordance with the QA/QC Plans submitted pursuant to this Decree, and shall utilize standard EPA chain of custody procedures, as documented in the National Enforcement Investigations Center Policies and Procedures Manual as revised in May 1986, and the National Enforcement Investigations Center Manual for the Evidence Audit published in September 1981, for all sample collection and analysis activities. In order to provide quality assurance and maintain quality control regarding all samples collected pursuant to this Decree, the Group A Settlors shall:

1. Ensure that all contracts with laboratories utilized by the Group A Settlors for analysis of samples taken pursuant to this Decree permit laboratory inspection by EPA personnel and EPA authorized representatives to assure the accuracy of laboratory results;

2. Ensure that laboratories utilized by the Group A Settlors for analysis of samples taken pursuant to this Decree perform analyses according to EPA methods as documented in the "Contract Lab Program Statement of Work for Inorganic Analysis" and the "Contract Lab Program Statement of Work for Organic Analysis:" dated July 1985 or other analytical methods approved by EPA; and

3. Ensure that all laboratories utilized by the Group A Settlors for analysis of samples taken pursuant to this Decree participate in an EPA or EPA equivalent QA/QC program. As part of the QA/QC program and upon request by EPA, such laboratories shall perform, at their expense, analyses of samples provided by EPA to demonstrate the quality of such laboratory's data. EPA may provide to each laboratory a maximum of eight samples per year

per analytical combination (e.g., eight aqueous samples for analysis by gas chromatography/mass spectrometry; eight soil/sediment samples for analysis by gas chromatography/mass spectrometry).

XII. SPILL/RELEASE CONTINGENCY PLAN

The Group A Settlors shall submit to EPA for approval in accordance with Section VIII herein, a Spill/Release Contingency Plan which shall address exposure of both site workers and the public to releases or spills at and/or from the Site. The Spill/Release Contingency Plan shall describe, but not be limited to the following:

1. safety concerns and notification procedures to be implemented in the event of an accident, system failure, or other unexpected event;
2. methods of controlling emissions during the Ground Water Remedial Action; and
3. the inclusion of action levels and proposed activities which will be taken in response to the exceedance of, or approach to, an action level.

XIII. COMMUNITY RELATIONS PLAN

The Group A Settlors shall develop and submit for EPA approval a Community Relations Plan. The Plan shall include but not be limited to making available all monitoring data, placing all approved plans and reports in the designated repositories, and sending a quarterly update to interested persons which shall summarize the previous quarter's activities and discuss the projected activities for the next quarter. Group A Settlors shall implement the approved Community Relations Plan for all phases of the Ground Water Remedial Action as set forth in Section VIII above.

XIV. SAMPLING AND ANALYSIS

A. The Group A Settlors shall use the quality assurance, quality control and chain of custody procedures specified in its QA/QC Plan for all sample collection and analysis conducted pursuant to this Decree.

B. Any data generated or obtained by the Group A Settlors that are related to the Site shall be provided to EPA within ten (10) days of receipt of any request by EPA for such data, in a form specified by the EPA Project Coordinator.

C. The Group A Settlors, in their contracts, shall provide that EPA personnel or authorized representatives be permitted access to any laboratory utilized by the Group A Settlors and/or their contractors in implementing this Decree. In addition, the Group A Settlors shall have such laboratory or laboratories analyze samples submitted by EPA for quality assurance/quality control review consistent with the QA/QC Plan.

D. EPA employees and EPA's authorized representatives shall have the right to split or take duplicates of any samples collected by the Group A Settlors or their agents at the Site during the implementation of the Ground Water Remedial Action.

E. During the Ground Water Remedial Action the Group A Settlors shall give EPA notice of any sampling conducted in accordance with RAS, CLP protocols in accordance with CLP sample space submittal requirements of which EPA will advise Group A Settlors and at least thirty (30) days notice of any sampling conducted in accordance with SAS, CLP protocols. If necessary, this notice may be provided orally to the EPA Project Coordinator. The EPA Project Coordinator may waive the notice requirement for designated sampling. Such waiver must be confirmed in writing by one of the Project Coordinators.

F. All data, factual information, and documents submitted by Group A Settlors to the EPA pursuant to this Decree shall be subject to public inspection pursuant to the procedures set forth in 40 C.F.R. Part 2. The Group A Settlors may not assert a claim of confidentiality regarding any hydrogeological or chemical data. However, the Group A Settlors may assert a claim of business confidentiality in accordance with 40 C.F.R. Part 2 and Section 104(e)(7) of CERCLA, for any process, method or technique or any description thereof that the Group A Settlors claim constitutes proprietary or trade secret information developed by the Group A Settlors or developed by any contractor or the contractor's subcontractors.

XV. REPORTING AND APPROVALS/DISAPPROVALS

The Group A Settlors shall provide written progress reports to EPA on a quarterly basis or as the Parties otherwise agree. These progress reports shall describe the actions that have been taken toward achieving compliance with this Decree, including a general description of activities completed during the past quarter, activities projected to be commenced or completed during the next reporting period, summary and evaluation of QA/QC information, and any problems that have been encountered or are anticipated by the Group A Settlors in commencing or completing the Ground Water Remedial Action. Progress reports shall include all data received during the reporting period and the status of credits accrued or applied under Section XXV (Stipulated Penalties).

These progress reports are to be submitted to EPA by the 15th of each month following completion of work done the preceding quarter and shall describe the work planned for the current quarter. The first quarterly progress report shall be submitted within thirty (30) days

after the effective date of this Decree. The discussion of problems in the quarterly progress report is not the notice specified for the Force Majeure in Section XXVI.

EPA will notify Group A Settlors of any deficiencies in the progress reports within fifteen (15) days of receipt of such report by EPA. Within fifteen (15) days of receipt by the Group A Settlors of a notice of deficiency of a progress report, the Group A Settlors shall make the necessary changes and resubmit the progress report to EPA.

XVI. SITE ACCESS

A. The Site Owner-Settlor shall:

1. Permit all Parties and their representatives, including but not limited to contractors, to have access at all times to the Site and to any contiguous property for purposes of performing all activities required by this Decree.

2. Not undertake any action which would or might interfere with implementation of the Ground Water Remedial Action or which would or might interfere with the integrity of the Remedial Action at any time.

3. Notify all Parties at least ninety (90) days prior to initiating any activity at the Site. The Owner-Settlor shall not initiate or permit any activity at the Site without the prior written consent of EPA and Group A Settlors' Project Coordinator.

4. Notify all parties at least ninety (90) days prior to any transfer, lease, or sale of any ownership interest in the Site. All potential and/or actual buyers and/or lessees shall be given copies of this Decree and all documents of transfer, lease, or sale must contain a provision requiring compliance with this Decree.

B. Within thirty (30) days of the effective date of this Decree, Group A Settlors and/or the Owner-Settlor shall record a copy of this Decree in the official public records of real property in Waller County to put any prospective purchaser of the property on notice of the existence of, and activities performed under, this Decree. The Group A Settlors shall provide EPA with notice of the date of filing and the county volume and page reference or the clerk's file number for the filed Decree.

C. To the extent that rights of access to property other than the Site is presently required for the proper and complete performance of this Decree, the Group A Settlors shall within sixty (60) days of the effective date of this Decree use due diligence (which need not include litigation) to obtain necessary access rights from the present owners or those persons who have control. Access agreements shall provide reasonable access to the Group A Settlors, the Trustees, the Contractor(s), the United States, the State, and their representatives. In the event that access rights are not obtained within the sixty (60) day period, the Group A Settlors shall notify EPA within sixty-five (65) days of the effective date of this Decree regarding both the lack of, and efforts to obtain, such access rights.

D. To the extent it becomes necessary during the performance of the Ground Water Remedial Action to obtain rights of access over property other than the Site for the proper and complete performance of this Decree, the Group A Settlors shall notify EPA forty-five (45) days prior to the date on which access is required or within seven (7) days of when Group A Settlors first became aware that such access is required, whichever is later, and during the period following such notice the Group A Settlors shall exercise due diligence (which need not include

litigation) to obtain access agreements from the present owners or those persons who have control.

E. During the effective period of this Decree, the United States, the State, and their representatives, including contractors, shall have the same access rights to the Site and contiguous areas as the Group A Settlors, for purposes of conducting any activity authorized by this Decree, including but not limited to:

1. Monitoring the progress of activities taking place;

2. Verifying any data or information submitted to EPA;

3. Conducting investigations relating to contamination at or near the Site;

4. Obtaining samples at the Site;

5. Inspecting and copying records, operating logs, contracts, or other documents required to assess the Group A Settlors' compliance with the Decree; and

6. Using photographic, videographic, or other recording devices.

F. No provision in this Section or this Decree is intended to limit any inspection or access authority that either the United States or the State of Texas may have under any other law.

XVII. ASSURANCE OF ABILITY TO COMPLETE WORK

A. The Group A Settlors shall demonstrate their ability to complete the Ground Water Remedial Action and to pay all claims that arise from the performance of the Ground Water Remedial Action by obtaining, and presenting to EPA for approval within thirty (30) days after the effective date of this Decree, one of the following items: 1) a performance bond; 2) a letter of credit; or 3) a guarantee by a third party. In lieu of any of the three items listed above, the Group A Settlors may present to EPA, within thirty (30) days after the effective date of this

Decree, financial information sufficient to satisfy EPA that the Group A Settlors have enough assets to make it unnecessary to require additional assurances. EPA will have ninety (90) days from the receipt of the information to make a determination of the adequacy of the financial assurance and to communicate that determination to the Group A Settlors. If EPA determines that the financial assurance submitted by the Group A Settlors is inadequate, EPA will provide to the Group A Settlors a brief explanation of the reasons supporting EPA's determination. Upon such notice, Group A Settlors shall either supply additional financial information or obtain one of the three financial instruments listed above.

B. Should EPA determine that the financial assurances submitted by the Group A Settlors are adequate, the Group A Settlors shall submit annual updated financial information to EPA during the pendency of the Ground Water Remedial Action. The yearly report should be submitted within thirty (30) days of the anniversary of the effective date of this Decree. If EPA determines the financial assurances of the Group A Settlors to be inadequate, the Group A Settlors shall supply additional financial information or obtain one of the three financial instruments listed above.

C. Anything herein notwithstanding, in no event shall the Group A Settlors be relieved of their responsibility to implement the Ground Water Remedial Action under this Decree in a timely fashion by reason of any inability to obtain or failure to maintain in force any insurance policies, or by reason of any dispute between the Group A Settlors and any of their insurers pertaining to any claim arising out of the Remedial Action, or arising out of any other activity required under this Decree.

XVIII. TRUST FUND

A. The Group A Settlors shall present to EPA a signed Trust Agreement establishing the "Sheridan Site Trust Fund" within ten (10) days after the effective date of this Decree. The Trust Agreement shall confer upon the Trustee all powers and authority necessary to fulfill the obligations of the Group A Settlors under this Decree. The Trust Agreement shall instruct the Trustees to use the money in the Sheridan Site Trust Fund: (1) to pay the contractor(s) for the work described in the ROD, (2) to pay other proper expenses required to be paid by the Group A Settlors pursuant to this Decree. In the event of the inability to pay or insolvency of any one or more of the Group A Settlors, or if for any other reason one or more of the Group A Settlors do not provide their share of funds to the trust, the remaining Group A Settlors agree and commit to fund, implement and complete the Ground Water Remedial Action and activities provided for in this Decree. Payment of money to the Sheridan Trust Fund is not a fine, penalty, or monetary sanction.

B. The Group A Settlors shall make payments to the Trust when and to the extent necessary to ensure the uninterrupted and timely completion of the Ground Water Remedial Action. Any interruption of the Ground Water Remedial Action due to the failure of Group A Settlors to make payments to the Sheridan Site Trust Fund shall be subject to the stipulated penalty provisions of Section XXV.

C. EPA does not in any respect guarantee the monetary sufficiency of the Sheridan Site Trust Fund.

D. With respect to this Decree, Group A Settlors authorize the Sheridan Site Trust to accept service of process on their behalf. The agent for service of process for the Sheridan Site Trust will be:

C T Corporation System
Americana Building
811 Dallas Avenue
Suite 1500
Houston, Texas 77002

XIX. PREAUTHORIZATION

Nothing in this Decree shall be considered to be a preauthorization of a CERCLA claim within the meaning of Section 111 of CERCLA and 40 C.F.R. § 300.25(d).

XX. RESPONSE COST REIMBURSEMENT

Within thirty (30) days of the effective date of this Consent Decree the Group A Settlors shall deliver a certified or cashiers check payable to the "Hazardous Substance Superfund" in the amount of $50,000 to the following address:

EPA Region VI/Sheridan Site
Superfund Accounting-Sheridan Site
P.O. Box 360582M
Pittsburgh, PA 15251

Such payment by the Group A Settlors is not a penalty, fine or monetary sanction, but is reimbursement to the United States for costs incurred by the United States with respect to the Ground Water Operable Unit at the Sheridan Site through September 30, 1989. The United States has continued to incur response costs since September 30, 1989, and anticipates that it will incur future oversight costs after the date of lodging of this Consent Decree. In full settlement of all claims by the United States or the EPA for future oversight costs, the Group A Settlors

agree to deliver a certified or cashiers check payable to the "Hazardous Substances Superfund" in the amount of $32,000 to the address listed above within thirty (30) days of the effective date of this Decree. Payment of the amounts required by this Section shall not waive the rights of the EPA to seek recovery of its future claims for costs related to the Group A Settlors' invocation of Dispute Resolution provisions of this Decree.

XXI. COVENANT NOT TO SUE

A. Except as expressly provided herein, the United States covenants not to sue or take any administrative action against the Settlors for any civil or administrative liability to the United States under CERCLA with respect to the Ground Water Operable Unit, including future liability, resulting from any release or threatened release of hazardous substances, which release or threatened release is addressed by the Ground Water Remedial Action. Further, the United States hereby expressly enters into a covenant not to sue Settlors for all costs incurred by the United States after September 30, 1989, with respect to the Ground Water Operable Unit at the Site, except for those costs payable under the Administrative Order on Consent, CERCLA VI-01-87, including any related interest determined in accordance with Section 107(a) of CERCLA, 42 U.S.C. § 9607(a). This Section is not, and shall not be construed as a covenant not to sue: (1) any Settlor in the event that the requirements of this Decree are not carried out; (2) any other person or entity not a party to this Decree; or (3) the Group A Settlors for EPA costs incurred relative to the Group A Settlors' invocation of the Dispute Resolution provision of this Decree. This Covenant Not to Sue does not apply to any future removal or remedial actions taken at the Site beyond the scope of this Decree including, but not limited to, the Source Control Operable

Unit. With respect to future liability, the Covenant Not to Sue shall take effect upon the issuance of a written Certification of Completion by EPA.

B. The Settlors hereby covenant not to sue the United States, including any and all departments, agencies, officers, administrators, and representatives thereof, for any claim, counter-claim, or cross-claim asserted, or that could have been asserted, arising out of or relating to the Site. This covenant not to sue does not apply to claims not now known to Settlors, as well as any future removal or remedial actions taken at the Site beyond those activities specified in this Decree.

C. The provisions of Paragraph A and B of this Section shall not apply to the following claims:

1. Claims based on a failure by the Settlors to fulfill the requirements of this Decree;

2. Claims for costs incurred by the United States as a result of the failure of the Settlors to fulfill the requirements of the Decree;

3. Claims based on criminal liability;

4. Claims based on liability arising from hazardous substances removed from the Site pursuant to this Decree by any Party;

D. Notwithstanding any other provisions of this Decree, the United States reserves the right to: (1) take appropriate response or enforcement action in this proceeding; or (2) institute a new action to seek additional removal or remedial measures at the Site beyond the scope of this Decree through an action to compel the Settlors to perform removal or remedial work with regard to the Ground Water Operable Unit; or (3) institute an action to compel the Settlors to

reimburse the United States or the State for response costs related to the Ground Water Operable Unit if:

1. For proceedings prior to EPA Certification of Completion of the Remedial Action:

a. conditions at the Site (including the release or threat of release of hazardous substances), previously unknown to the United States or its contractors are discovered after the entry of this Decree; or

b. information is received after the date of entry of this Decree;

and these previously unknown conditions or this information indicates that the Ground Water Remedial Action is not protective of human health and the environment;

2. For proceedings subsequent to EPA Certification of Completion of the Remedial Action:

a. conditions at the Site previously unknown to the United States or its contractors are discovered after the Certification of Completion; or

b. information is received after the Certification of Completion by EPA;

and these previously unknown conditions or this information indicates that the Ground Water Remedial Action is not protective of human health and the environment;

E. If Settlors are in compliance with the terms of this Decree, the parties to this Decree agree that the Settlors are entitled to the contribution protection provided by Section 113(f)(2) of CERCLA, for matters covered by the Covenant Not to Sue of this Decree. The United States shall be under no obligation to assist the Settlors in any way in pursuing or defending against suits for contribution brought against the Settlors alleging liability for matters covered by this

Covenant Not to Sue by persons or entities that have not entered into this Decree. Nothing in this paragraph shall be deemed to modify the provisions of 40 C.F.R. § 2.401 et seq.

XXII. PAYMENT BY GROUP B SETTLORS

Each Group B Settlor listed in Attachment C has paid to the Sheridan Site Trust the amounts set forth in Attachment C.

Payments of the listed amounts shall fully relieve each Group B Settlor of any other obligations under this Decree. The payment shall also entitle each Group B Settlor to the contribution protection and to the Covenant Not to Sue under Section XXI as described therein with respect to the Ground Water Operable Unit.

The Group A Settlors have assumed all civil liability under CERCLA of the Group B Settlors to the United States relating to the Ground Water Operable Unit at the Site.

XXIII. INDEMNIFICATION

The Group A Settlors shall indemnify the United States and hold the United States harmless for any claims arising from any injuries or damages to persons or property resulting from any acts or omissions of the Group A Settlors, their contractors, subcontractors, or any other person acting on their behalf in carrying out any activities pursuant to the terms of this Decree. Provided, however, that the foregoing indemnity shall not be applicable to matters arising from negligent or willful acts or omissions of the United States of its officers, employees, agents, contractors, subcontractors or any other person acting on its behalf.

XXIV. RESERVATION OF RIGHTS AND RETENTION OF CLAIMS

A. By entering this Decree the Parties do not release or covenant not to sue any other persons or entities, not party to this Decree, from any claims or liabilities which may exist. The right to pursue such claims or liabilities is expressly reserved.

B. This Decree does not create any private causes of action in favor of any person not a signatory to this Decree or release any person not a signatory to this Decree from any liability, duty, responsibility, or obligation which they otherwise might have at law or equity.

C. The entry of this Decree shall not be construed to be an acknowledgement by the Settlors that the release or threatened release concerned constitutes an imminent and substantial endangerment to the public health or welfare or the environment. Except as otherwise provided in the Federal Rules of Evidence, the participation by any Settlors shall not be considered an admission of liability for any purpose, and the fact of such participation shall not be admissible in any judicial or administrative proceeding including a subsequent proceeding under this Section. Further, Settlors do not admit, and specifically deny, responsibility for the disposal of materials at the Site and deny any legal or equitable liability under any statute, regulation, ordinance, or common law for any response costs or damages caused by storage, treatment, handling, disposal, or presence of materials or actual or threatened release of materials at the Site.

D. Nothing in this Decree shall be deemed to limit the response authority of the United States pursuant to any federal response authority under any law. However, the United States may not utilize response authority to obtain a result inconsistent with the exercise or result of Dispute Resolution under this Consent Decree.

E. The Settlors reserve all rights, defenses, claims, causes of action or counterclaims which they may have at law or in equity against any person or other entity not a signatory to this Decree for any liability it may have arising out of or relating to the Site.

F. The Settlors shall have the benefit of Section 113(f) of CERCLA and any other applicable rights to limit their liability to persons or entities not parties to this Decree, to seek contribution, together with any other equitable or legal remedy which Settlors may have, from any person or entity not a party to this Consent Decree for costs incurred or any other relief with respect to the Site in order to enable the Settlors to recover the full relief available to them at law or in equity.

G. Settlors waive any defenses based on the doctrines of res judicata, collateral estoppel and/or claim splitting which Settlors may have in this action or any other proceeding as to any claim by the United States for further remediation at the Site other than the Ground Water Operable Unit.

XXV. STIPULATED PENALTIES

A. Subject to the Force Majeure and Dispute Resolution provisions in this Decree the Group A Settlors shall pay stipulated penalties as set forth below:

1. For each failure to submit an adequate quarterly progress report, Group A Settlors shall pay a stipulated penalty of $2,000. For each failure to submit a quarterly progress report in a timely fashion in accordance with Section XV, Group A Settlors shall pay stipulated penalties of $500 per day up to a total of $2,000. For each failure to submit a quarterly progress report at all, the Group A Settlors shall pay a stipulated penalty of $10,000.

2. For each failure of a laboratory to retain samples in accordance with CLP guidelines, Group A Settlors shall pay a stipulated penalty of $3,000 for each sample.

3. For each failure to cease activity when the EPA Project Coordinator orders a cessation or halt of activities in accordance with Section IX.A., Group A Settlors shall pay a stipulated penalty of $25,000 per day.

4. For each failure to meet any requirement in this Decree (except for those activities covered in 1, 2 and 3 above), including but not limited to submittal of a late report, the Group A Settlors shall pay stipulated penalties in the amount set forth below for each day, or part thereof during which the violation continues:

Period of Failure to Comply	Penalty Per Violation Per Day
1st through 5th day	$ 750
6th through 14th day	$ 1,500
15th through 45th day	$ 3,000
46th day and beyond	$ 6,000

B. If any required plans submitted by Group A Settlors are submitted in advance of any deadline applicable under this Decree, the Group A Settlors shall obtain a day of credit for each day of early completion. This credit may be used to extend the deadlines for submitting subsequent plans. A maximum of ten (10) days credit may be accrued, and a maximum of ten (10) days credit may be applied to extend any one deadline. Credit for early submission of progress reports can only be applied to submission of other progress reports.

C. Except as otherwise provided, stipulated penalties shall begin to accrue from the date of violation and run until the violation is corrected. EPA shall advise the Group A Settlors in writing as soon as EPA has knowledge that a violation subject to stipulated penalties has

occurred. Failure of EPA to advise Group A Settlors in a timely manner shall not be a waiver of the stipulated penalties.

D. A single act or omission shall not be the basis for more than one type of stipulated penalty. However a single act or omission which continues for more than one day may result in more than one day of stipulated penalties.

E. Payment of Stipulated Penalties

1. Stipulated penalties shall be paid by certified or cashier's check and shall be paid within thirty (30) days of receipt of a demand letter for payment sent by EPA.

2. During the pendency of any dispute resolution of this Decree, stipulated penalties shall continue to accrue, but the obligation to pay shall be stayed until the dispute is resolved. If the Group A Settlors are successful in any Dispute Resolution, they shall have no liability to pay stipulated penalties or other sanctions with regard to the matter submitted for Dispute Resolution.

3. The United States may, within its sole and nonreviewable discretion, waive imposition of all or any part of any stipulated penalties.

4. The check for stipulated penalties or any other payment due the United States pursuant to this Decree shall be made payable to the Hazardous Substance Superfund and sent to:

United States Environmental Protection Agency Superfund -
Sheridan Site, Region 6
P.O. Box 360582M
Pittsburgh, PA 15251

Attention: Superfund Accounting

A copy of the transmittal letter, which shall include a brief description of the violation and the check, shall be sent to EPA in accordance with the Notice provisions.

XXVI. FORCE MAJEURE

A. Force Majeure, for purposes of this Decree, is defined as any event arising from causes beyond the control of the Group A Settlors that delays or prevents the performance of any obligation under this Decree and which could not have been prevented or mitigated by the exercise of due diligence by the Group A Settlors, and which delays or prevents the performance of any obligation under this Consent Decree. Force Majeure shall not include increased costs or expenses of the Ground Water Remedial Action; any unwillingness or inability to pay by one or more Group A Settlors; any inability to obtain or failure to maintain in force any insurance policies; any dispute between Group A Settlors and any of their insurers; or the Group A Settlors' failure to apply for any necessary approvals or to provide all required information therefor in timely manner.

B. When circumstances are occurring or have occurred that delay or prevent the performance of any obligation under this Decree, whether or not due to Force Majeure, the Group A Settlors shall promptly (in no event later than ten (10) days from the time the Group A Settlors or the Group A Settlors' contractors or subcontractors knew or with due diligence should know that a delay has been or will be encountered) supply a written notice as set forth in the Notice section of this Consent Decree. The Notice shall include a detailed explanation of the reason(s) for and anticipated duration of any such delay; the measures taken and to be taken by the Group A Settlors to prevent or minimize delay; and the timetable for implementation of such measures. Failure to notify in writing within the required ten (10) days shall constitute a waiver

of any claim of Force Majeure. The Group A Settlors shall exercise due diligence to minimize the effect of any Force Majeure condition and not delay the performance of any activities not affected by the event of Force Majeure.

C. If the United States agrees that a delay is or was attributable to a Force Majeure, the parties shall modify the applicable schedule to provide such additional time as may be necessary to allow the completion of the specific obligation and/or any succeeding phase of the work affected by such delay, for a period equal to the actual duration of the delay plus reasonable additional time for the resumption of work.

D. If the EPA and Group A Settlors cannot agree as to whether the reason for the delay was Force Majeure, or whether the duration of the delay is or was warranted under the circumstances, the Parties shall resolve the dispute according to the Dispute Resolution provisions of this Consent Decree.

E. Denial of Access to the Site or any act by the Owner-Settlor that interrupts or delays the Ground Water Remedial Action shall be a Force Majeure only with respect to the non-Owner-Group A Settlors, if it interferes with implementation of the Remedial Action by the non-Owner-Group A Settlors.

XXVII. DISPUTE RESOLUTION

A. If the Parties cannot resolve any dispute arising under this Decree then the interpretation advanced by the United States shall control unless the Group A Settlors invoke the Dispute Resolution provisions of this Section. All activities not affected by the dispute shall continue in accordance with the approved schedules, plans, reports, or documents.

B. Any dispute that arises with respect to the meaning or application of this Decree shall, in the first instance, be the subject of good faith informal negotiations between the Parties. Such period of informal negotiations shall commence upon the transmission by the Group A Settlors to the United States of written notification of the invocation of Dispute Resolution. Informal negotiations shall not extend beyond forty-five (45) days from the date EPA receives notification unless the Parties agree otherwise in writing.

C. If any dispute is not resolved within fifteen (15) days after notice of the existence of the dispute is provided to EPA, Group A Settlors shall have the right to submit the dispute to an EPA Region VI Hearing Officer for a non-adjudicatory hearing on the record for resolution within an additional thirty (30) day period.

D. If agreement is not reached during the period of informal negotiations, or a Hearing Officer renders a decision adverse to Group A Settlors, the Group A Settlors may file, within thirty (30) days of the end of the informal negotiation period or such decision, a petition with the Court requesting the Court to hear and resolve the dispute. The petition shall describe the nature of the dispute, all documents which support the Group A Settlors' position, and include a proposal for its resolution. The United States shall have thirty (30) days to respond to the petition.

E. In any dispute, the Group A Settlors shall have the burden based on the record of proving that EPA's position is arbitrary and capricious, or otherwise not in accordance with law.

F. Unless otherwise specifically set forth herein, the fact that Dispute Resolution is not specifically set forth in the individual Sections of this Decree is not intended to and shall not

bar the Group A Settlors from invoking this Section as to any dispute issue arising under this Decree.

XXVIII. RETENTION OF RECORDS

A. All Group A Settlors shall insure that all records and documents now in their possession or control that relate in any manner to the Site, regardless of any document retention policy to the contrary, are preserved and retained for a period of six years after the termination of this Decree, except for those records and documents described in B below. The EPA shall insure that all records or documents in its possession or control that relate in any manner to the Site are preserved and retained in accordance with its applicable document retention procedures. If such records or documents are to be destroyed earlier than six years after the termination of this decree, the party proposing to destroy documents shall give all other parties prior notice of such destruction and provide an opportunity for retention.

B. Until termination of this Consent Decree, the Group A Settlors shall preserve, or shall instruct the Contractor, the Contractor's subcontractors, and anyone else acting on the Group A Settlors' behalf at the Site to preserve (in the form of originals or exact copies, or in the alternative, microfiche of all originals) all other records, documents, and information of whatever kind, nature, or description relating to the performance of the Ground Water Remedial Action. Upon issuance of the Certificate of Completion, Group A Settlors may either preserve or give to EPA and shall instruct their contractors and subcontractors, and anyone else acting on the Group A Settlors behalf to preserve or give to EPA all records, documents and information of whatever kind, nature or description relating to performance of the Ground Water Remedial Action. For records retained after the Certification of Completion, Group A Settlors and anyone

else acting on the Group A Settlors' behalf shall provide notice to EPA ninety (90) days prior to the destruction of such records and shall deliver such records to EPA upon request.

XXIX. FORM OF NOTICE

All notices including approvals and disapprovals required to be given pursuant to this Decree shall be in writing unless otherwise expressly authorized and shall be deemed delivered when either hand delivered or mailed via certified letter or its equivalent. Documents, including reports, approvals, and other correspondence, to be submitted pursuant to this Decree shall be hand delivered or sent by certified mail or its equivalent to the following addresses or to such other address as the Group A Settlors and EPA may hereafter designate in writing:

As to the EPA:

Office of Regional Counsel
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202-2733

and

Chief, Superfund Enforcement Branch
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202-2733

and

The EPA Project Coordinator
- Sheridan Site Superfund Texas Section (6H-ET)
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202-2733

and

up to two EPA Contractors as EPA directs.

As to the United States

Chief, Environmental Enforcement Section
Land and Natural Resources Division
U.S. Dept. of Justice
P.O. Box 7611
Ben Franklin Station
Washington, D.C. 20044

As to the State:

Hazardous and Solid Waste Division
Texas Water Commission
Capitol Station
P.O. Box 13087
Austin, Texas 78111

Attention: TWC Project Coordinator/Sheridan Site

As to Group A Settlors:

Sheridan Site Project Manager
P.O. Box 440005
Houston, Texas 77244-0005

Attention: John Cotterell

and up to two other addressees as Group A Settlors direct.

XXX. ADMISSIBILITY OF DATA

No Party shall have the right to object to the admissibility into evidence of analytical data that it gathers and generates on the grounds of hearsay or on the grounds of its own failure to maintain chain of custody. No Party shall have the right to object to the admissibility of

analytical data sought to be introduced by another Party if the appropriate procedures, delineated in Section XI, were followed with respect to such data. For the purpose of seeking the admission into evidence of analytical data each Party may demonstrate compliance with the appropriate procedure through one summary witness per laboratory.

XXXI. MODIFICATION

Except as provided for herein, there shall be no modification of this Decree without written approval of all parties to this Decree and entry by the Court.

XXXII. TERMINATION AND SATISFACTION

The provisions of this Decree shall be deemed satisfied upon the Group A Settlors' receipt of written notice from EPA that the Group A Settlors have demonstrated, to the satisfaction of EPA, that all of the terms of this Decree have been completed.

XXXIII. SEVERABILITY

The nullification of any or more provisions of this Decree, either by agreement of the Parties or by judicial action shall not affect the validity of effectiveness of the remaining provisions.

XXXIV. SECTION HEADINGS

The section headings set forth in this Decree and its Table of Contents are included for convenience of reference only and shall be disregarded in the construction and interpretation of any of the provisions of this Decree.

XXXV. CONTINUING JURISDICTION

The Court specifically retains jurisdiction over both the subject matter of and the Parties to this action for the duration of this Decree for the purposes of issuing such further orders or

directions as may be necessary or appropriate to construe, implement, modify, enforce, terminate, or reinstate the terms of this Decree or for any further relief as the interest of justice may require.

XXXVI. PUBLIC COMMENT

This Decree is subject to the public comment provisions of CERCLA Section 122, 42 U.S.C. § 9622.

XXXVII. EFFECTIVE DATE

This Consent Decree is effective upon the date of its entry by the Court.

SIGNED AND ENTERED this 16th day of October 1997

John D. Rainey
United States District Judge

SHERIDAN GROUNDWATER CONSENT DECREE

For the United States:

BARRY M. HARTMAN, Acting Assistant
Attorney General
Environment and Natural Resources Division
United States Department of Justice

Date: NOV 20 1991.

BEVERLEE J. DeSTEIN, Trial Attorney
Environmental Enforcement Section
Environment and Natural Resources Division
United States Department of Justice
10th & Pennsylvania Avenue, N. W.
Washington, D.C. 20530

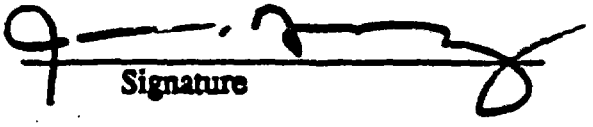
Date: November 25th 1991.

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Juan M. Gomez



Signature

March 8, 1990

Date

Vice President, Finance

Title

Anderson, Greenwood & Co.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Robert W. Kent
Signature

2/22/90
Date

Corporate Vice President - Law,
General Counsel and Secretary
Title

ARMCO INC.
Company
Group B Settlor

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlor:

Richard Sloan
Signature

April 2, 1990
Date

Manager - Compliance + Audit
Title

ARCO Chemical Co
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Gale A. Hansen
Signature

FEB 19, 1990
Date

EXEC. VICE PRES.
Title

AZTEC MFG. CO.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Thomas Cason
Signature

3/13/90
Date

Thomas W. Cason, Senior Vice President
and Chief Financial Officer
Title

BAKER HUGHES INCORPORATED, on its own behalf and
as successor-in-interest to HUGHES TOOL COMPANY

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Janet D. Smith
Signature

February 21, 1990
Date

Associate General Counsel
Title

Baroid Corporation (for NL Industries, Inc.)
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Paul T. Santilli — March 6, 1990

Signature — Date

Paul T. Santilli,
Vice President and General Counsel
Title

BATTELLE MEMORIAL INSTITUTE
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Richard A Brown
Signature

2-27-90
Date

Vice President
Title

Bernard Realty Service Co.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

William C. Bruffard
Signature

MARCH 23, 1990
Date

VICE PRESIDENT
Title

BETZ LABORATORIES, INC
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3/15/90
Signature Date

Senior Corporate Counsel
Title

The B.F. Goodrich Company
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ March 7 1990
Signature Date

Donald L. Stichler

Secretary and Treasurer
Title

Best Industries, Inc. for Varco/
Best Flow Products (for Best
Industries)

_____
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2/28/90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature _____ Date 2/28/90

(PRES)
Title

BOEING SPECIALTIES INC
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Richard Fowler IV 2/27/90
Signature Date

Executive Vice President
Title

Borden, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3/2/90
Signature Date

Asst Gen Counsel
Title

Beloit Corp.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

February 20, 1990
Date

Charles R. Cunningham

Attorney for

Title

Briner Paint Mfg. Co., Inc.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Richard Fowler VP 2/27/90
Signature Date

Executive Vice President
Title

Borden, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2/28/90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature _____ Date 2/28/90

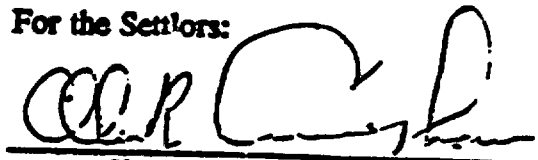
(Pres)
Title

Boring Specialties Inc
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:



Signature

February 20, 1990
Date

Charles R. Cunningham

Attorney for

Title

Briner Paint Mfg. Co., Inc.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3/2/90
Signature Date

Asst Gen Counsel
Title

Beloit Corp.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Gerald K. Burger
Signature

February 19, 1990
Date

Gerald K. Burger

Vice President/Secretary
Title

Browning-Ferris Industries
Chemical Services, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

February 21, 1990
Date

Vito F. Sassone

Vice President/Treasurer
Title

THE CELOTEX CORPORATION
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Benjamin S. Bilus
Signature

February 26, 1990
Date

Senior Associate Counsel
Title

Champion International Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] May 3, 1990
Signature Date

President
Title

Charter International Oil Company
Company

019579

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated ____________, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] ____________ Signature

2/20/90 ____________ Date

Ex. V P. ____________ Title

CXI ____________ Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

William J. O'Kane
Signature

_____
Date

William J. O'Kane

Secretary and General Counsel
Title

Chemical Leaman Tank Lines, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

W. O. Bartenbach — March 22, 1990

Signature — Date

President

Title

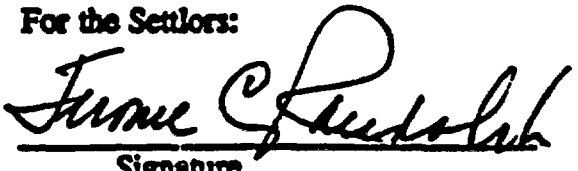
C + H Transportation Co., Inc.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:



Signature

3-28-90
Date

Attorney for Cintas
Title

CINTAS CORPORATION, formerly known as
INDUSTRIAL TOWEL & UNIFORM
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature _____ Date 3-2-90

Vice President, Employee Relations and Environmental Affairs
Title

Cooper Industries, Inc.
Company on behalf of
Cameron Iron Works
and Cameron Forge Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature _____ Date 2/26/1990

VICE PRESIDENT/OPERATIONS
Title

AUSTIN AMERICAN-STATESMAN
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature WILLIAM J. WITT

March 7, 1990
Date

MANAGER - CERCLA OPERATIONS
Title

THE DOW CHEMICAL COMPANY
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3/15/96
Signature Date

VICE PRES. ENVIRONMENTAL AFFAIRS
Title

DIXIE CHEMICAL CO.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

RE _____ February 19, 1990
Signature Date

President
Title

Dailey Petroleum Services Corp.
successor in interest to
Dailey Oil Tools, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ March 5, 1990
Signature Date

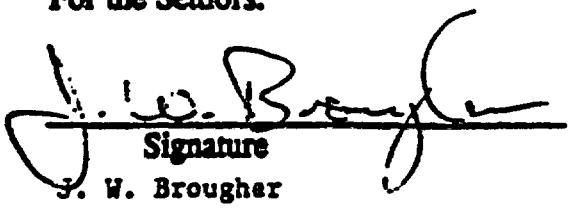
Vice President - Legal
Title

Crown Central Petroleum Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:



Signature

J. W. Brougher

February 26, 1990

Date

President

Title

Gulf Forge Company

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3-5-90
Signature Date

Daniel J. Eaton
Vice President & Chief Financial Officer
Title

Grant Oil Tool by Tubular Corporation
Company
Tubular Finishing Works

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3-13-90
Signature Date

ROBERT M HEHIR
VICE PRESIDENT
Title

THE GOODYEAR TIRE & RUBBER COMPANY
Company

Attest: _____
Assistant Secretary

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated February 22 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] 2-22-90

Signature Date

TREASURER

Title

GENERAL WELDING WORKS, INC.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Roger C Swift
Signature

3/12/90
Date

Regional Vice-President
Title

GATX Terminals Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 2/26/98
Signature Date

PRESIDENT
Title

GAMMALOY, LTD.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Dennis G. Benzlei
Signature

3/16/90
Date

VP Human Resources
Title

Galveston-Houston Co.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated Feb. 14, 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Luther P. Hendon — Feb. 23rd 1990

Signature — Date

Luther P. Hendon

Individual

Title

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated Feb. 14, 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

Date

George Whitten

Individual

Title

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated Feb. 14, 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ _____

Signature Date

George Whitten

President

Title

French Limited, Inc.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated Feb. 14, 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature — Date

George Whitten

President
Title

French Limited of Houston, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

JR Comerdale
Signature

2.27.90
Date

Director of Manufacturing
Title

FMC
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

R. K. Haney
Signature

March 13, 1990
Date

General Manager
Title

Evans Cooperage of Houston, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3/5/96
Signature Date

Vice President - Polymers Americas
Title

Exxon Chemical Company
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2/14/90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

C. B. Hunt
Signature

3/14/90
Date

Resident Manager
Title

Ethyl Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 3-13-90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

William D. Morrison
Signature

3-13-90
Date

President
Title

Elf Atochem
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

MW

R W McInnis
Signature

March 2, 1990
Date

Plant Manager
Title

E. I. du Pont de Nemours & Co. (Inc.)
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Richard A. Davis

Richard A. Davis
Signature

February 22, 1990
Date

President
Title

Enterprise Transportation Company (formerly Cango Corporation)
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ March 21, 1990
Signature B. D. St. John Date

Executive-Vice President -- Administration
Title

Dresser Industries, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3-1-90
Signature Date

_____
Title

_____
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

2/21/95
Date

President
Title

OKP, Inc. f/k/a Kyanize Paints, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated March 5, 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

S. Maynard Turk — March 5, 1990

Signature — Date

Vice President & General Counsel

Title

Hercules Incorporated

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Harry R. Benz
Signature

3/26/90
Date

Vice President - Finance
and Chief Financial Officer
Title

Hoechst Celanese Corporation
Company

Gary M. Rowen
Signature

Associate General Counsel, Hoechst Celanese Corp.
Attorney for Hoechst Celanese Chemical Group, Inc.
Title

Hoechst Celanese Chemical Group, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2/14/90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

2-19-90
Date

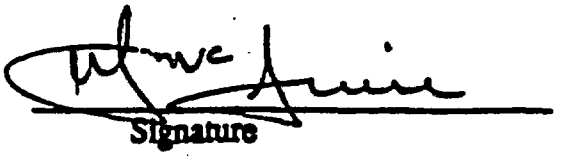
VP
Title

Honco (for Chance Collar)
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:



Signature

3/9/90
Date

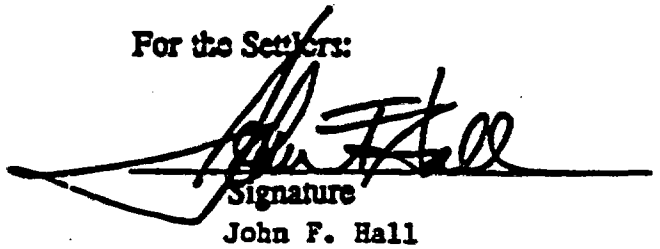
General Manager,
Energy Production Technical
Title

Houston Lighting & Power Company
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlers:



Signature

March 1, 1990
Date

John F. Hall

Vice President & Secretary
Title

HYDRIL COMPANY
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ March 14, 1990
Signature Date

Vice President & General Counsel
Title

ICI Americas Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Arthur G. Rems
Signature

March 5, 1990
Date

President
Title

Jacob Stern & Sons, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

W H Tunnell
Signature

3/9/90
Date

General Manager
Title

Jetco Chemicals, Inc
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature _____ Date 2.19.90

Senior Environmental Counsel
Title

Kraft General Foods, Inc. formerly known as Kraft, Inc. as successor in interest to Dart Industries, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Philip L. Krug
Signature

March 12, 1990
Date

Philip L. Krug

Executive Vice President
Title

The Lubrizol Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ MARCH 23, 1990
Signature Date

V-P, GENERAL MANAGER
Title

MARLIN VALVE COMPANY, INC.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2-15-90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature _____ Date 3-27-90

President
Title

Massey Grinding Service, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

H. W. Fleming
Signature

2/27/90
Date

Exec Vice Pres
Title

Merichem Co
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

R K Davidson

Signature

2/27/90

Date

R. K. Davidson

Executive Vice President-Operation

Title

Missouri Pacific Railroad Co.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3/14/90
Signature James H. Vines Date

VP HES/PM
Title Vice President

MOBAY CORP
Company

Mobay Corporation
Mobay Road
Pittsburgh, PA 15205-9741
(In the capacity of Group B Settlor)

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] 3/23/90
Signature Date

DIRECTOR, REMEDIAL PROJECTS
Title

MONSANTO CO.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Anthony Kadanuk
Signature

March 15, 1990
Date

Vice President,
Environmental Health & Safety
Title

Nalco Chemical Company
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

M. J. Tomana — Signature
M. J. TOMANA

3/21/90 — Date

Associate General Counsel & Assist. Secretary — Title

National Steel Products Company — Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ Signature

3/23/90 Date

Vice President
Title

Stauffer Management Company for
Stauffer Chemical Company
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____________, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] ____________________
Signature

4/23/90 ____________________
Date

Vice President Administration ____________________
Title

Tenneco, Inc (For Allstate Vacuum & Tanks, Inc.) ____________________
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

2-22-90

Signature G. B. Bonfield Date 2/18/90

Vice President
Title

Tenneco Polymers, Inc. (Includes Petro-Tex Chemical Corporation for this purpose)
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Harold J. Weiss
Signature Harold J. Weiss

3-7-90
Date

Program Manager
Title

Texaco Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] Signature

Feb. 19, 1990 Date

Owner Title

Texas Bolt Co. Company

[illegible] GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

IN THE CAPACITY OF A de minimis (class B) settlor
For the Settlors:

Dan V. Barfield, Jr.
Signature

February 21, 1990
Date

Manager of Corporate Safety, Environmental and Energy
Title

TEXAS INSTRUMENTS INCORPORATED
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Carl C. Washington — March 1, 1990

Signature — Date

Vice President - Treasurer

Title

Texas Iron Works, Inc.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2/14/90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Robert D. Wells
Signature

March 9, 1990
Date

Vice President and
Manager of Operations & Finance
Title

T H AGRICULTURE & NUTRITION CO., INC.
Company

"Group B Settlor"

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature
John N. Baird

March 15, 1990
Date

Secretary
Title

Secretary and General Counsel

Liquid Air Corporation
Company

Liquid Air Corporation

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Patricia Houle
Signature PATRICIA HOULE

FEBRUARY 26, 1990
Date

CORPORATE ENVIRONMENTAL MANAGER
Title

THE O'BRIEN CORPORATION
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Michael J. Rudick
Signature

March 9, 1990
Date

Vice President and General Counsel
Title

Occidental Chemical Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

March 8, 1990
Date

Title

Oil Field Rental Service Company
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

March 7, 1990
Date

R.B. Dokell

President
Title

Olshan Demolishing Company, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2-14-1990 ~~3-22-90~~, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

James C. Hoffman
Signature

3-22-90
Date

Jr. V.P.
Title

OTECO EQUIPMENT CO.
Company

[illegible] GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

Date 3/21/90

Title

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

March 22, 1990
Date

Manager, Environmental Affairs
Title

Paktank Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] 3.14.90

Signature Date

President

Title

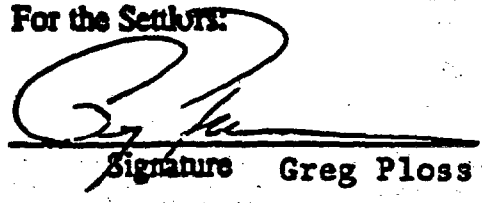
Petrolite Corporation

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2/15/90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlor:



Signature Greg Ploss

March 8, 1990
Date

Vice-President
Title

Ploss Industries, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ _____
Signature Date

_____
Title

_____
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ March 1, 1990
Signature Date

Director of Regulatory Affairs
Title

Reichhold Chemicals Incorporated
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated Feb 2, 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] — Signature

Feb. 2, 1990 — Date

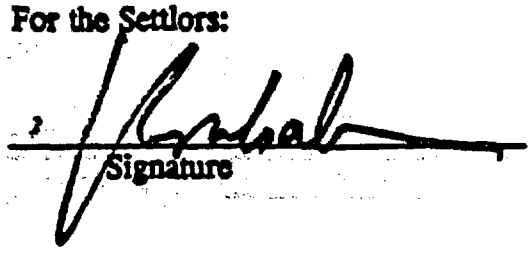
Director of Environ. Law — Title

Segua Corporation — Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:



Signature

February 22, 1990

Date

Group Vice President

Title

Rohm and Haas Company

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

Date 7/26/90

President & CEO
Title

Reno Aggregates
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Stephen Robinson
Signature

3/21/90
Date

Vice-President
Title

Robinson Brothers Metal
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Madelyn A. Reilly
Signature

March 14, 1990
Date

Attorney
Title

PPG Industries, Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Mark C. Matthews — Signature

May 5 1995 — Date

Vice President & General Patent Counsel — Title

The Quaker Oats Company — Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated ____________, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

H.E. Hanailey
Signature

3-12-90
Date

General Manager
Title

Port Terminal Railroad Assoc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated ____________, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

________________________ 3-8-90
Signature Date

Office Mgr
Title

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Robert F. Briggs
Signature

02/23/90
Date

Robert F. Briggs

General Counsel
Title

Johnston
(Schlumberger Well Services)
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Thomas R Miller — March 16, 1990

Signature — Date

Manager, Products Environmental Conservation, Manufacturing & Technical

Title

Shell Oil Company, P.O. Box 4320, Houston, TX 77251

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

Duane Sheridan — 8-15-90
Duane Clifford Sheridan — Date

Grace Crafton Woolever Sheridan — 8-15-90
Grace Crafton Woolever Sheridan — Date

[signature] — 8-15-90
Rupert Daniel Sheridan — Date

Pat John Sheridan — 8-22-90
Pat John Sheridan — Date

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Joe V. Walden
Signature

Joe V. Walden

March 2, 1990
Date

Vice President
Title

SIGMOR NO. 5007, INC.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

May 4, 1990
Date

Chief Financial Officer
Title

SMITH INTERNATIONAL, INC.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

James A Brunt
Signature

3-7-90
Date

V. P. OPERATIONS
Title

SOUTH COAST TERMINALS, INC.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

Date 3/23/90

Vice President
Title

Stauffer Management Company for
Stauffer Chemical Company
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated __________, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature]
Signature

4/23/90
Date

Vice President Administration
Title

Trainer, Inc (For Hillsfield Vacuum & Tanks, Inc.)
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

GBB 2-28-90 _____ Signature G. B. Bonfield

2/28/90 Date

Vice President Title

Tenneco Polymers, Inc. (Includes Petro-Tex Chemical Corporation for this purpose) Company

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Harold J. Weiss
Signature Harold J. Weiss

3-7-90
Date

Program Manager
Title

Texaco Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

[signature] Signature

Feb. 19, 1990 Date

Owner Title

Texas Bolt Co. Company

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

IN THE CAPACITY OF A de minimis (class B) settlor
For the Settlors:

Dan V. Barbash, Jr.
Signature

February 21, 1990
Date

Manager of Corporate Safety, Environmental and Energy
Title

TEXAS INSTRUMENTS INCORPORATED
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Carl C. Washington — March 1, 1990

Signature — Date

Vice President - Treasurer

Title

Texas Iron Works, Inc.

Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated 2/14/90, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Robert J. Wells
Signature

March 9, 1990
Date

Vice President and
Manager of Operations & Finance
Title

T H AGRICULTURE & NUTRITION CO., INC.
Company

"Group B Settlor"

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature
John N. Baird

March 15, 1990
Date

Secretary
Title
Secretary and General Counsel

Liquid Air Corporation
Company
Liquid Air Corporation

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ 3/26/90
Signature Date

Vice President
Title

Bayou Refining Co / KSA Industries Inc and Affiliates
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated ____________, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Jay C. McElroy [signature] 2-22-96
Signature Date
Jay C. McElroy

Executive Vice President - Operations
Title

Transcontinental Gas Pipe Line Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

_____ February 19, 1990
Signature Date

Senior Counsel - Environment
Title

TRW Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlor:

Signature _____ Date March 27, 1990

Title Vice President

Company Tuboscope Inc.

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

R. Van Hynen — Signature

2-27-90 — Date

R. Van Hynen
Vice President, Health, Safety
and Environmental Affairs
Title

Union Carbide Chemicals and Plastics Company Inc.
Formerly
Union Carbide Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Harold Kahl — Signature

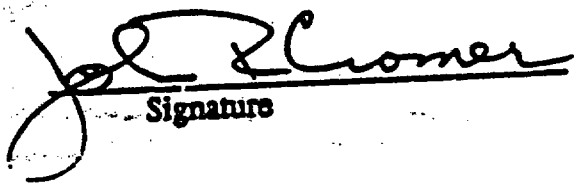
2-16-90 — Date

President — Title

United Galvanizing Inc. — Company

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:



Signature

3-5-90
Date

ATTORney for
Title

The Upjohn Co.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

P. X. Masciantonio
Signature

March 23, 1990
Date

Vice President - Environmental Affairs
Title

USX Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated February 14, 1990, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

C.E. Hanson
Signature

3/9/90
Date

Vice President, Environmental Management
Title

VELSICOL CHEMICAL CORPORATION
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors: VETCO GRAY INC.
(Successor to Gray Tool Company)

_____ _____
Signature Date

_____
Title

_____
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Signature

Feb 24, 1990
Date

PRESIDENT
Title

CONSTRUCTION PRODUCTS DIVISION

W.R. GRACE & CO.-CONN.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

Steven Clark
Signature

2-28-90
Date

Vice Pres.
Title

W. T. Byler Co Inc
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:
B. W. BYRNE

B. W. Byrne
Signature

3-3-90
Date

Vice President
Title

Warren Petroleum Company, a division of Chevron U.S.A. Inc.
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

William A. Habart
Signature

March 15, 1990
Date

House Counsel - Midwest Region
Title

Pearsall Chemical/Witco Corporation
Company

SHERIDAN SITE GROUND WATER CONSENT DECREE

The undersigned has reviewed the Ground Water Consent Decree dated _____, and evidences its agreement thereto by signature of its authorized representative.

For the Settlors:

R. W. Hardwick — February 28, 1990

Signature — Date

R. W. Hardwick

Vice President

Title

Wyatt Industries, Inc.

Company

APPENDIX A

RECORD OF DECISION

FOR

SHERIDAN DISPOSAL SERVICES SITE

WALLER COUNTY, TEXAS

(GROUND WATER MIGRATION MANAGEMENT OPERABLE UNIT)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1989

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Sheridan Disposal Services site, Waller County, Texas

STATEMENT OF PURPOSE

This decision document outlines the selected remedial action for the second operable unit at the Sheridan Disposal Services site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

On December 29, 1988, a Record of Decision (ROD) was signed which selected the appropriate remedial action for the Source Control Operable Unit for the Sheridan site. The Source Control ROD addressed the risks associated with exposure to contaminated soils and sludges on the site.

This document is the ROD for the second operable unit, hereafter referred to as the Ground Water Migration Management, or GWMM unit. The ROD for the GWMM unit addresses the risks associated with the potential or actual exposure to contaminated ground water.

The State of Texas (through the Texas Water Commission) has been provided an opportunity to comment on the technology and degree of treatment proposed by the Record of Decision. The letter describing the State's concurrence with the selected remedy is found in Appendix C.

STATEMENT OF BASIS

This decision is based on the administrative record for the Sheridan site. The index found in Appendix A identifies the items which comprise this administrative record.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

Upon review of the information contained in the administrative record, it is EPA's judgment that the natural attenuation alternative best serves both statutory and selection criteria in relation to the other solutions evaluated. A detailed description of this remedy and an explanation of how it meets statutory requirements is contained in the attached "Summary of Remedial Alternative Selection."

I. SITE LOCATION

The Sheridan Disposal Services site is located approximately nine miles north-northwest of the City of Hempstead in Waller County, Texas. The site covers about 110 acres in a 700-acre tract of land which is bordered by the Brazos River to the north and Clark Road to the South (See Figures 1 and 2).

Located at the site are a lagoon (12-22 acres depending on water levels), a 17-acre dike surrounding the lagoon, and a 42-acre evaporation/land irrigation system. An incinerator and a group of nine storage tanks which were used for waste storage and treatment are located on the lagoon dikes. These site features are illustrated in Figure 3.

The predominant land-use within a four-mile radius of the site is agriculture and range land. The only primarily residential area within this four-mile radius is the community of Brown College. This community is made up of approximately 20 residences and is located one and one half miles north of the site. Nearby communities primarily utilize ground water from the Evangeline aquifer to meet their water supply needs.

The site is relatively flat, but slopes gently to the south. It lies within the 100-year floodplain of the Brazos River. However, the lagoon dikes have been built up to an elevation above that of the floodplain.

II. SITE HISTORY AND ENFORCEMENT

Sheridan Disposal Services operated as a commercial waste disposal facility from about 1958 to 1984. A wide variety of organic and inorganic chemical and solid wastes were disposed of at the site. The facility treated waste by steam distillation, open burning and incineration. The lagoon was developed in a low-lying area of the site and was used as a holding pond, and for the disposal of overflow wastes and waste treatment residues. In 1976, the facility initiated use of the evaporation system for disposal of water which accumulated on the lagoon.

The site's regulatory history began in 1963 when the Texas Water Quality Board (now known as the Texas Water Commission) issued a permit authorizing disposal of industrial solid waste. After permitting, the Texas Water Quality Board (TWQB) received complaints concerning odor, runoff and oil in the Brazos River. The State also noted increased concentrations of contaminants in on-site monitoring wells.

In 1970, the TWQB and Waller County filed suit against the Sheridan facility. After a series of meetings and public hearings, in 1975, a judgement was entered by the Court which prohibited further discharge of wastes into the lagoon. The TWQB and Sheridan Disposal Services discussed numerous closure plans for the lagoon until the TWQB determined that the facility did not have the economic or technical resources necessary to close the lagoon properly. In 1984, the Texas Department of Water Resources (successor of the TWQB) sent letters to generators and transporters of waste managed at the site to notify them of their potential liability under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

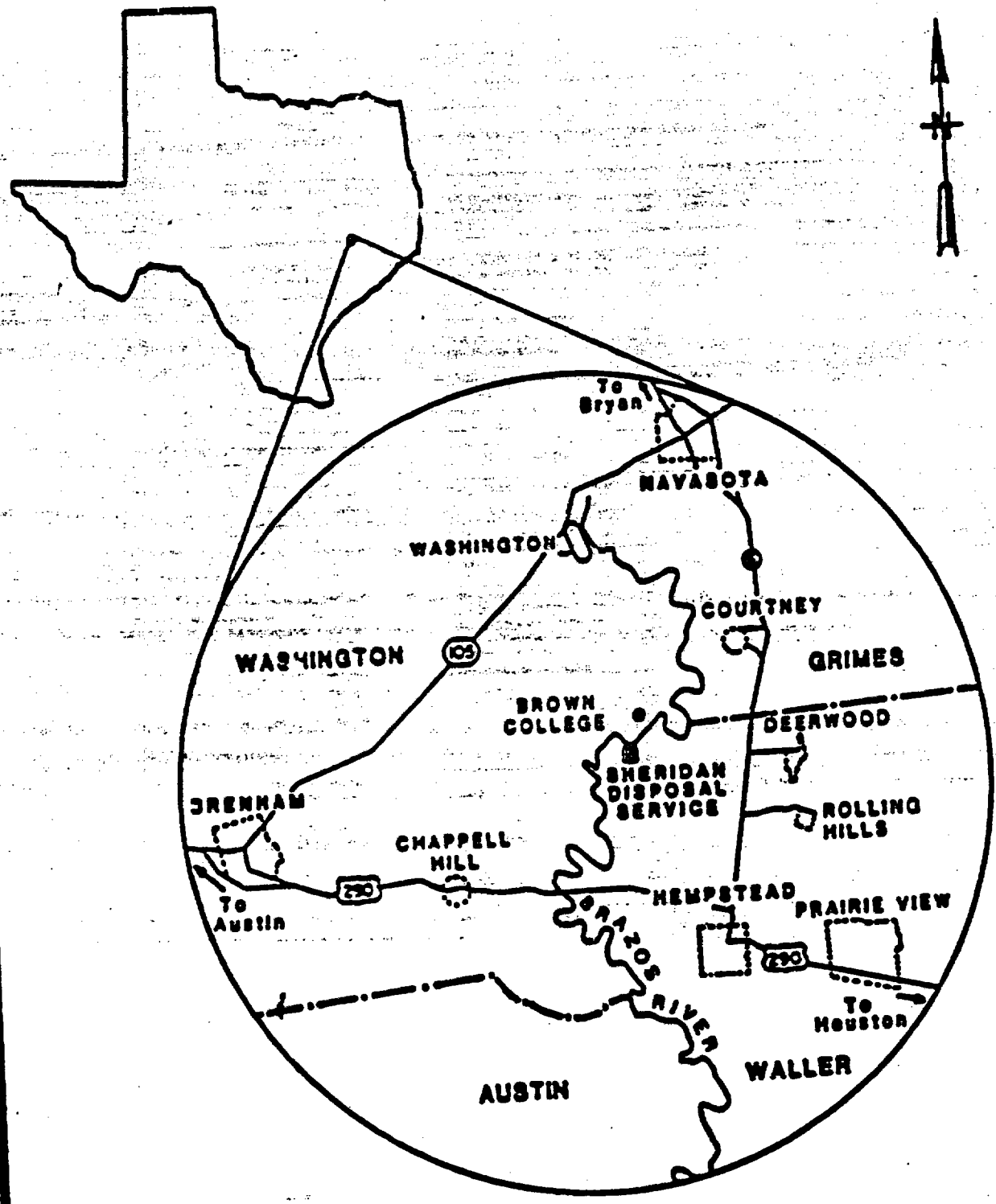


FIGURE 1
SITE LOCATION MAP
SHERIDAN DISPOSAL SERVICE

Table 1

Geologic description and water-bearing properties of the geologic units forming the aquifers in Austin and Waller Counties

Aquifer	Stratigraphic unit	Estimated thickness in area (feet)	General composition in Austin and Waller Counties	Surface expressions	Water-bearing properties in Austin and Waller Counties
Alluvial	Tributary alluvium and flood-plain alluvium of the Brazos River	0- 80	Unconsolidated gray, brown, and reddish-brown clay, silt, and sandy clay, commonly overlying light-colored sand or coarser-grained sand and gravel.	Occurs along the banks of smaller streams and in the flood plain of the Brazos River. Nearly flat plains. Soils are reddish to dark-brown and black soils.	Yields small to large amounts of fresh water in the flood plain of the Brazos River.
Beaumont	Beaumont Clay	0- 75	Mottled red, reddish-brown, brown and gray, dense clay with white calcareous nodules. May contain lenses of fine and medium-grained sand or sand and gravel in places.	Occurs only along the fringes of the Brazos River flood plain. Forms nearly flat, narrow plain. Soils are gray to black, blocky.	Yields small to moderate amounts of water to scattered shallow wells less than 100 feet deep along the edge of the Brazos River flood plain.
Pleistocene	Montgomery Formation	0- 407	Light gray to light brown, fine-grained sand, silt, and clay, probably grading with depth to darker-colored coarser sand and in places basal sand and gravel.	Nearly flat, featureless plain; soils are light colored, fine-grained sandy. Occurs only along southern edge of area.	Yields small amounts of water to scattered shallow wells.
	Bentley Formation	0- 307	Alternating beds of reddish-brown to yellow and gray, mottled clay interbedded with grayish, fine- to coarse-grained sand and gravel lenses. Scattered lentils of lime-cemented sandstone. Clay, sandy clay, and fine sand predominate in the upper part, darker-colored coarser sand and gravel in the lower part.	Forms flat plains in the southern one-third of the counties; most of the rice-growing area is on the outcrop. Forms light-colored sandy loam soils.	Contributes small to moderate amounts of fresh water to domestic wells in the southern part of the area; probably represented by the uppermost water screened in these wells.
	Willis Sand	0- 2407	Alternating beds of mottled red, yellow, brown, and gray clay and sand with scattered lenses cemented sand and quartz gravel. Ferruginous nodules common. Packed and hard in fresh exposures. Basal part is usually a hard, gravelly sand and clay.	Forms the gently-rolling sand hills of northern Waller County and central Austin County. Most of the gravel pits in Austin County are in the basal Willis. Forms tan sandy soils.	Yields small to large amounts of fresh water to wells.
	Oakland Sand	0- 2407	White to gray, sticky, calcareous clay with interbedded lenses of light-colored, gravelly sand and lime-cemented sandstone. Black chert grains in the whitish sand give a salt and pepper effect.	Occurs as isolated surface exposures because the Oakland is overlapped by the Willis Sand or is easily removed by erosion. Forms gray, sticky soils. Usually occurs along valley bottoms and walls.	Yields large amounts of fresh water to wells.
	Fleming Formation	0-1,700	Interbedded clay and sand; clay predominantly in the upper part. The blocky, dense clay is various shades of gray, yellow, olive, and brown. White calcareous nodules are common. Sand is gray to brown, brown, interbedded with gray clay. Sand is medium to fine grained and often cross-bedded.	Forms the rolling and dissected topography of northern Austin County. Forms gray to black loam and sandy loam soils.	Yields small to large amounts of fresh to slightly saline water.
Burkeville Aquiclude					
Jasper	Catahoula Sandstone	?	Alternating beds of gray clay, tuff, and sand. Lower sands may be hard, white, and have saline appearance.	Does not crop out in Austin or Waller Counties. Difficult to distinguish from overlying Fleming Formation in both surface exposures and in well logs.	May yield small amounts of fresh water in the most northern part of Austin County. Generally water is at least slightly saline.
	Undifferentiated	—	Alternating beds of gray sand, sandstone, and shale.	Does not crop out in Austin or Waller Counties.	Would yield only saline water.

Source: Texas Water Development Board, Report 88

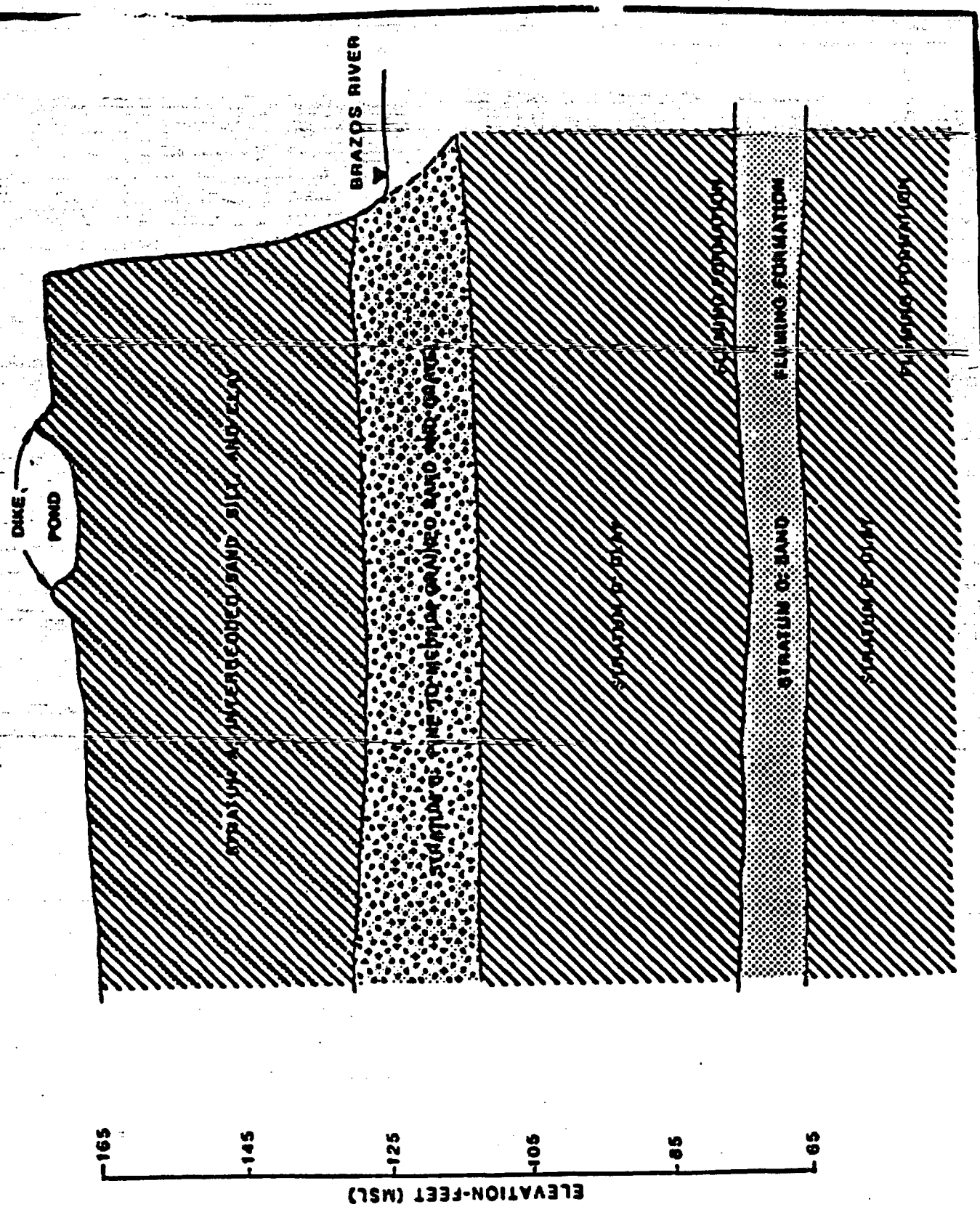


FIGURE 4

GENERAL SCHEMATIC SITE GEOLOGY

SHERIDAN DISPOSAL SERVICE

In response to this notification, the Sheridan Steering Committee, which is now known as the Sheridan Site Committee, organized and began to investigate the extent of contamination at the site. After polychlorinated biphenyls (PCBs) were identified in the lagoon, EPA became directly involved in site closure through the Toxic Substances Control Act. The site was ranked according to the Superfund Hazardous Ranking System and on June 10, 1986, the site was proposed for inclusion on the National Priorities List. The basis for inclusion on the NPL was primarily the volume, toxicity and mobility of contaminants found at the site and ground water contamination resulting from the site.

In June and July of 1986, 102 Notice/Information request letters were sent to site Potentially Responsible Parties (PRPs). During this time, the Sheridan Site Committee submitted a Remedial Investigation to EPA for evaluation. After reviewing this document the Agency determined that additional field investigations would be necessary to obtain adequate information on which to base a ground water remedy decision. However, in order to expedite lagoon cleanup and reduce further leaching into ground water, the site was divided into two operable units, a Source Control unit which was addressed in a previous ROD and the Ground Water Migration Management (GWMM) unit which is addressed in this ROD.

On February 3, 1987, 59 companies who were members of the Sheridan Site Committee entered into an Administrative Order on Consent with EPA to complete both the Source Control and GWMM remedial investigation/feasibility studies (RI/FSs). In 1988, EPA issued a unilateral order to site PRPs to lower the level of water in the lagoon. This action was implemented by the Committee's contractor with EPA oversight.

After the ROD for the Source Control operable unit was issued, additional Notice/ Information request letters were issued and Special Notice letters informing PRPs of the Remedial Design/Remedial Action (RD/RA) Moratorium period were submitted to over 180 PRPs. The Sheridan Site Committee, the Department of Justice (DOJ) and EPA have reached a tentative agreement for Source Control remediation.

EPA will continue its enforcement activities and send Special Notice Letters to PRPs prior to the initiation of the remedial design of the GWMM operable unit. Should the PRPs decline to conduct future remedial activities, EPA will either take enforcement actions or provide funding for these activities while seeking cost recovery for all EPA-funded response actions from the PRPs.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In general, there has been a long history of citizen awareness of the Sheridan Disposal Services site. In the early 1970s when incineration at the site resulted in air emissions, people living within a 7-mile radius complained. In 1971 a citizens' group submitted a petition with over 500 signatures to the Texas Water Quality Board calling for its closure. However, community concerns of either the area residents or local officials are now very low, probably because the site has been inactive since 1984. Also the site is relatively remote and there are no residences within a mile.

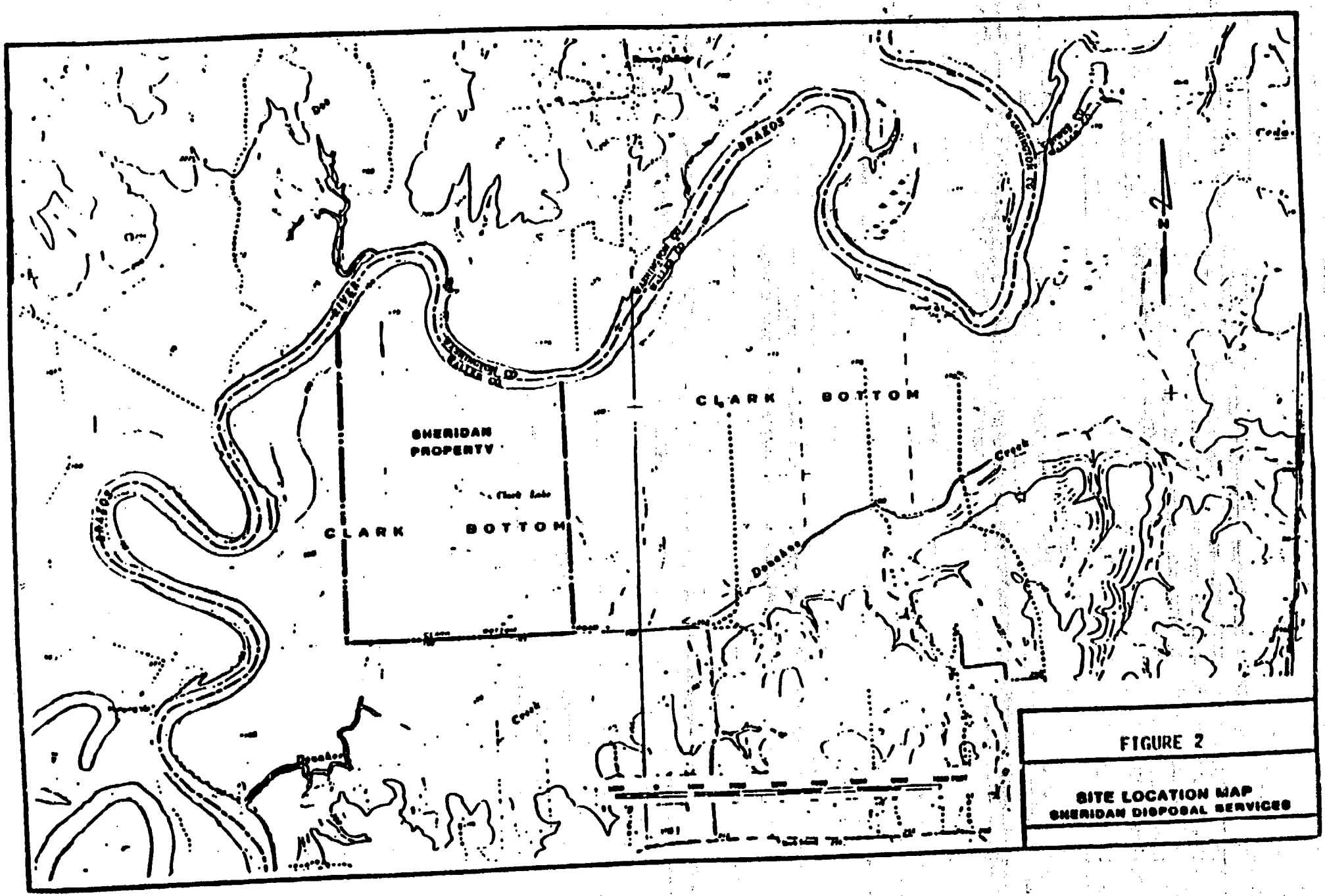


FIGURE 2

SITE LOCATION MAP
SHERIDAN DISPOSAL SERVICES

The proposed plan fact sheet announcing the public comment period and opportunity for a public meeting for the ground water portion of the site was distributed on July 31, 1989. The comment period began on August 14, 1989 and ended on September 11, 1989. No one responded to the offer of a public meeting and none was held. No written comments or questions were received by EPA.

IV. SCOPE AND ROLE OF OPERABLE UNIT

This ROD describes the remedy selection process for the second operable unit, which is known as the Ground Water Migration Management (GWMM) unit. The function of this operable unit is to prevent potential exposure to contaminated ground water and ensure protective levels are maintained in the Brazos River.

The ROD for the Source Control Operable unit at the site was issued in December 1988. The Source Control ROD addressed the risks associated with exposure to contaminated soils and sludges from the site.

V. SITE CHARACTERIZATION

5.1 GEOLOGY

The Sheridan site lies on the Brazos River Alluvium of recent age, which is comprised of gravel, sand, silt and clay deposited by the meandering river. The Brazos River Alluvium unconformably overlies the Miocene-aged Fleming formation. The Fleming is made up of interbedded sand and clay layers. Table 1 provides a general description of the hydrogeologic units present in Waller and Austin counties. However, all formations from the Goliad sand to the Beaumont clay are not present beneath the site.

According to the Austin sheet of the Geologic Atlas of Texas, no faults with surface expression occur in the vicinity of the site. Field investigations conducted by the responsible parties' contractor verified this conclusion. The Hockley escarpment and salt dome are found about 18 miles south of the site and the Millican fault zone lies approximately 20 miles to the north. However, there is no evidence that these features influence the hydrogeology of the site.

5.2 HYDROGEOLOGY

The alluvium of the Brazos River forms the first Regional aquifer beneath the site. The Evangeline and Jasper aquifers underlie the alluvium. Most wells in the vicinity of the site tap the Evangeline aquifer, which is about 450 feet thick beneath the site.

Figure 4 describes a general cross-section of site hydrogeology. The first water-bearing unit, which is referred to as the shallow aquifer, is identified in the cross-section as Stratum B. This aquifer is part of the sediments of the Brazos River Alluvium. The second water-bearing unit, know as the deep aquifer, is identified as Stratum D. This unit is part of the Evangeline aquifer. The clay layer know as Stratum E lies beneath the confined aquifer at about 100 feet in depth and was the deepest unit investigated at the site.

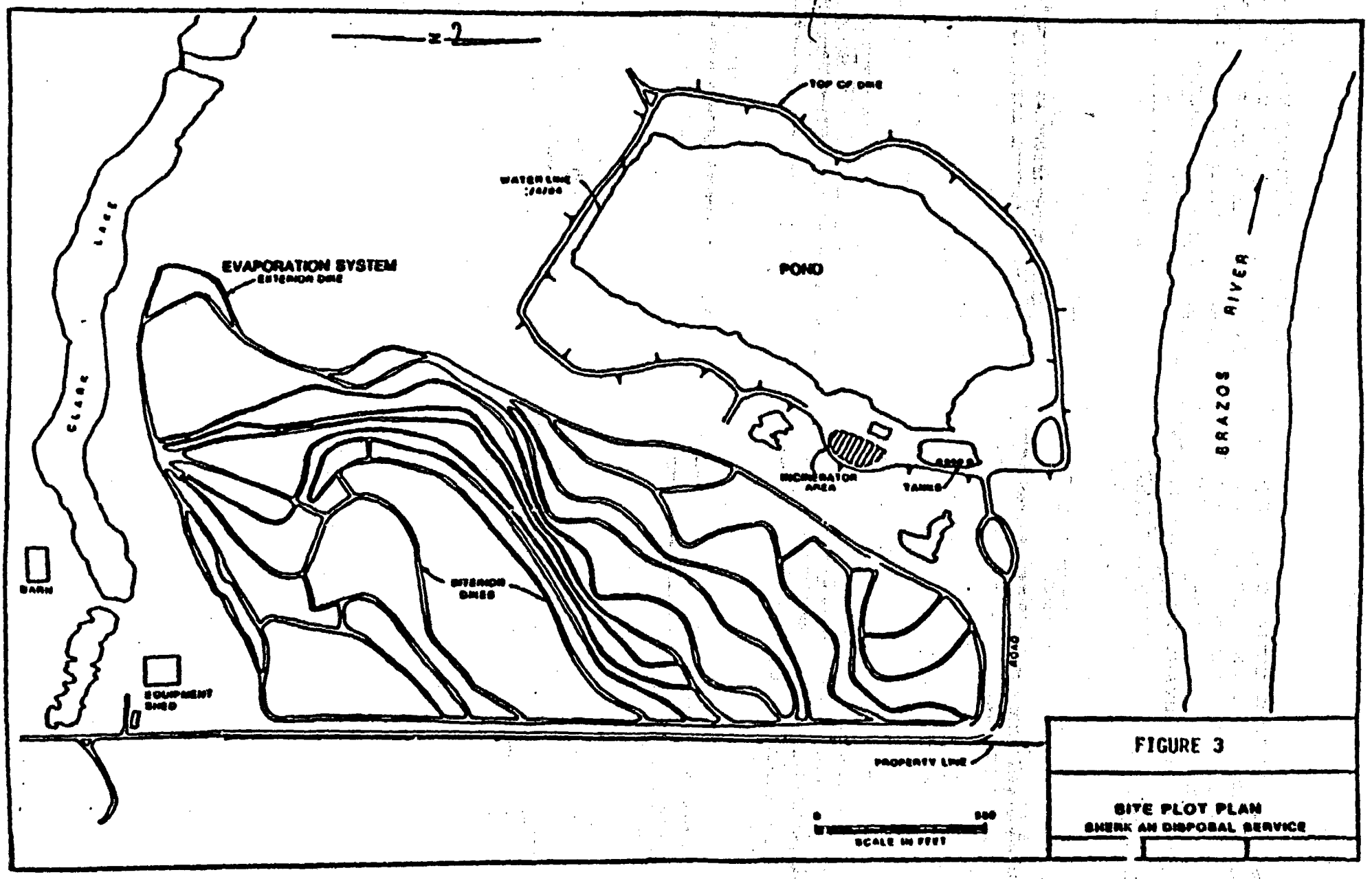


FIGURE 3

SITE PLOT PLAN
SHERK AN DISPOSAL SERVICE

Ground water in the water table and confined aquifers generally flows towards the river, in a northwestern direction. However, during high river stage conditions (less than about one third of the time) ground water flow in the water table aquifer may shift to the west and south. The predominant vertical hydraulic gradient is upwards from the confined aquifer towards the water table aquifer.

5.3 SAMPLING RESULTS

A. Soil and Sludge

The results of the soil and sludge sampling may be found in the site Source Control RI/FS and risk assessment. Both organic and inorganic (metal) contaminants were detected at the site. The most significant contaminants in terms of toxicity and mobility are PCBs, benzene, toluene and trichloroethylene. A summary of this information is found in EPA's ROD dated December, 1988.

B. Surface Water

Sampling of the Brazos River downstream and upstream of the site indicated that there was no measureable difference in water quality between the downstream and upstream samples. Sediment samples were also obtained from the river bottom at locations downstream and upstream of the site. Concentrations of organic constituents indicated that the site had not impacted the sediment however, concentrations of metals were slightly higher in the downstream sample than the upstream sample. Analyses of Clark Lake water and sediments do not exhibit elevated levels of site contaminants.

C. Ground Water

Over thirty wells have been installed at the site in both the shallow and deep aquifers to determine the extent of contamination and evaluate site hydrogeology. Table 2 shows the highest levels of contaminants detected in the shallow wells to date and Figure 5 illustrates the extent of contamination in the shallow aquifer. No contamination has been detected in the deep aquifer. The only significant group of contaminants identified in the shallow ground water are volatile organics. However, the Maximum Contaminant Level (MCL) for arsenic was exceeded in one well by .01 ppm during one sampling period. The highest concentration of contaminants detected during recent sampling was benzene, at 130 ppb.

D. Air

Extensive air sampling has been completed at the site. No priority pollutant constituents were detected at concentrations above ambient background levels.

VI. SUMMARY OF SITE RISKS

The assessment of risk posed by the Sheridan site was evaluated in the Sheridan Risk Assessment. This assessment examined the amount, concentration, properties, and environmental fate and transport of chemical found at the site; the populations and environments potentially at risk; exposure

Table 2

Summary of Highest Levels of Contaminants Detected in Shallow Ground Water
for
SHERIDAN DISPOSAL SERVICES SITE

Well Number: / Sampling Dates:		MW3 6/84	MW12 Upgradient 4/89	MW34 10/87 (4/89)	MW37 10/87 (4/89)	MW38 10/87 (4/89)	MW39 10/87 (4/89)
Contaminant	**Units**						
Benzene	ppb	ND	ND	27 (130)	ND	ND	ND
Tetrachloroethylene	ppb	ND	ND	ND	13 (18)	21	ND
Trans-1,2 dichloroethylene	ppb	ND	ND	25 (30)	5.2 (6.1)	43	ND
Trichloroethane	ppb	ND	ND	15 (14)	ND	13 (10)	ND
Chlorodibromomethane	ppb	11	ND	ND	ND	ND	ND
Chloroform	ppb	60	ND	ND	ND	ND	ND
Dichlorobromethane	ppb	63	ND	ND	ND	ND	ND
1,1,1-trichloroethane	ppb	11	ND	ND	ND	ND	ND
Isophorone	ppb	30	ND	ND	ND	ND	ND
Arsenic	ppb	NA	ND	ND	ND	ND	43 (60)
Copper	ppb	NA	78*	ND	ND	6	8
Selenium	ppb	NA	ND	ND	ND	ND	ND

ND - Not detected detection limits differ slightly for each sampling event

NA - Not Analyzed

* Anomalously high levels of copper were detected in upgradient wells in April 1989. Since copper is not a site contaminant and it was found in highest concentrations in upgradient locations distant from the waste areas, it is thought to result from sampling apparatus, off-site hydrocarbon recovery operations, or landowner activities.

pathways; and potential exposure events. The document described the risks associated with current and future (probable and worst-case) exposure scenarios. The numerical cancer risk values discussed below are theoretical quantifications of the excess lifetime cancer risk, that is, the increased probability of contracting cancer as a result of exposure to wastes, compared to the probability if no exposure occurred. For example, a 10^{-6} excess cancer risk represents an exposure that could result in one extra cancer case per million people exposed.

Three scenarios were developed in the site risk assessment. The first scenario evaluated is for current conditions which assume restricted site access and maintenance of the site. The second scenario addresses the risks associated with the most probable future land use conditions. These conditions assume continued agricultural (rangeland) use and unrestricted access to wastes. The third scenario describes the risks associated with the worst-case future scenario of residential development adjacent to the waste areas.

Under current conditions which assume restricted site access and maintenance of the site, the only potentially significant pathway is migration of contaminants into the Brazos River. This pathway was modelled using very conservative assumptions, resulting in an upper bound excess cancer risk from the ingestion of PCBs in fish of 1.5×10^{-5} (1.5 excess cancer cases per 100,000 people exposed). Modelling using less conservative assumptions indicated that the 1×10^{-6} excess cancer risk would not be exceeded. However, it should be noted that both models assume essentially all of the source will leach into the ground water over time; This is not expected to occur since the majority of contamination will be addressed by the Source Control remedy.

The second scenario evaluated was the most probable future land use which assumed continued agricultural (rangeland) land use and unrestricted access to the waste disposal area. This scenario differs from the first only with regard to exposure to lagoon sludges which is addressed in the Source Control ROD. Therefore, the risks associated with this scenario are identical to the first.

The last scenario evaluated in the Risk Assessment is the worst-case scenario of residential development adjacent to the waste areas. The pathway previously described for the current-use scenario of migration of contaminants into the Brazos River would be similar in the residential scenario. However, an additional exposure pathway of ingestion of contaminated ground water would result in a total excess cancer risk greater than 1×10^{-3} as well as a significant non-carcinogenic risk posed by phenol (Hazard Risk [1] of 15). Phenol is potentially the most significant non-carcinogenic contaminant which could could impact ground water.

The preceding paragraphs describe potential impacts to human health. Analyses of water and sediments in the Brazos River indicate that the ground water is not adversely impacting potential environmental receptors in the Brazos River.

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[1] The risk for a non-carcinogenic compound is described by a Hazard Index. A hazard index is the ratio of the contaminant concentration to EPA's reference dose for the contaminant. A value greater than one indicates that the ambient concentration of a contaminant is higher than the acceptable reference dose, and may be significant.

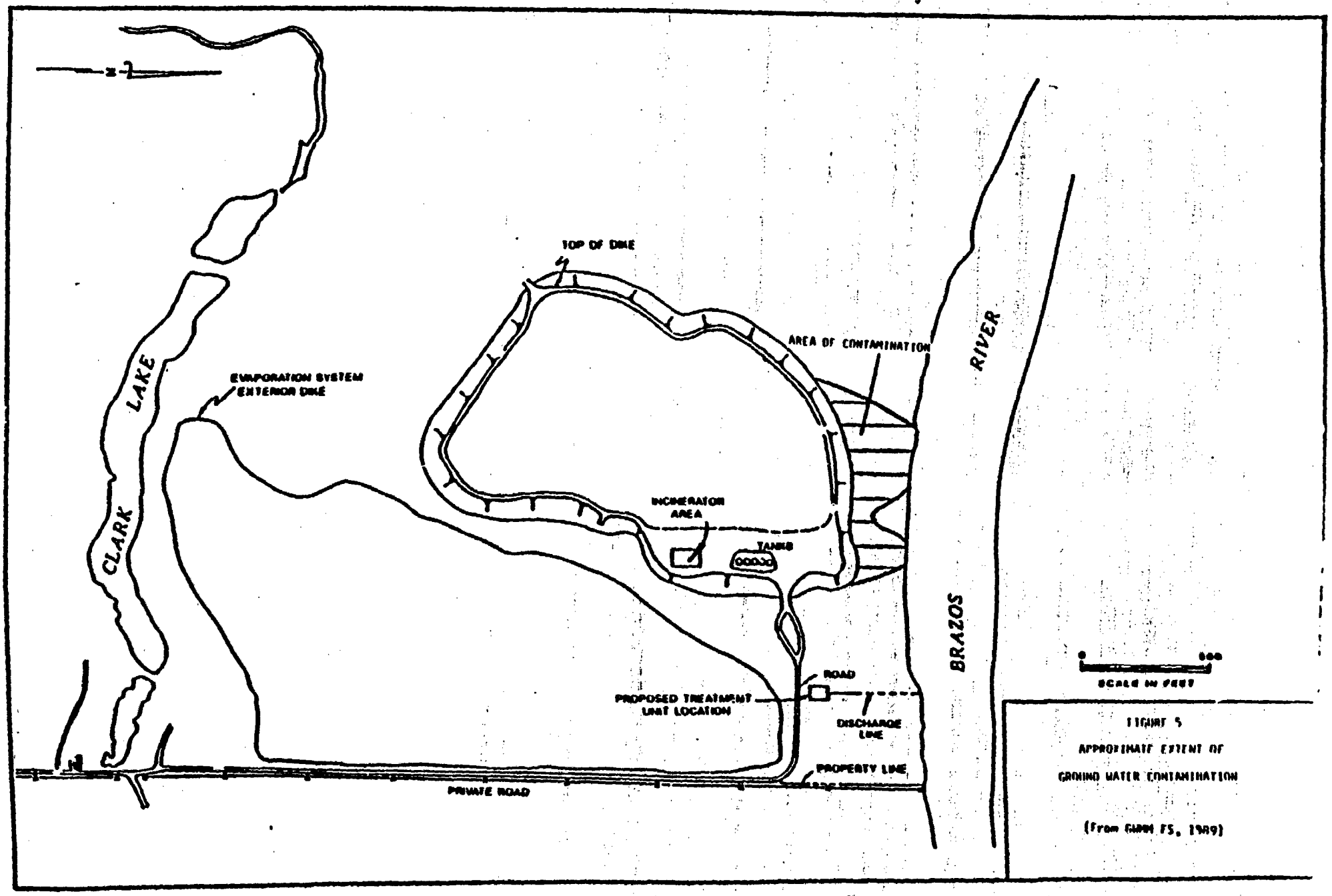

FIGURE 5

APPROXIMATE EXTENT OF

GROUND WATER CONTAMINATION

(From GUNN FS, 1989)

The actual or threatened releases of hazardous substances from the site described above, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. ALTERNATIVE EVALUATION

7.1 EVALUATION CRITERIA

In accordance with Section 121 (a), (b), and (d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC Section 9621(a)(b) and (d), EPA has determined that nine factors must be considered in selecting a remedy for a Superfund site. Two of the criteria, Protection of Human Health and the Environment and Consistency with Other Laws, are known as Threshold Criteria which must be met. Long-term Effectiveness and Permanence, Reduction of Toxicity, Mobility, or Volume, Short-term Effectiveness, Implementability and Cost are considered to be Primary Balancing Criteria. Modifying Criteria include State Acceptance and Community Acceptance. These criteria are summarized below:

A. Overall Protection of Human Health and the Environment

Following the analysis of the remedial options against individual evaluation criteria, the alternatives are assessed from the standpoint of whether they provide adequate protection of human health and the environment.

B. Consistency with Other Environmental Laws

In determining appropriate remedial actions at Superfund sites, consideration must be given to the requirements of other Federal and State environmental laws, in addition to CERCLA as amended by SARA. Primary consideration is given to attaining applicable or relevant and appropriate Federal and State public health and environmental laws and regulations and standards. Not all Federal and State environmental laws and regulations are applicable to each Superfund response action. The compliance of each remedial alternative with all applicable or relevant and appropriate environmental laws is discussed in Appendix C.

C. Long-term Effectiveness and Permanence

Alternatives are assessed for the long-term effectiveness and permanence they afford along with the degree of certainty that the remedy will prove successful. Factors considered are:

- Magnitude of residual risks in terms of amounts and concentrations of wastes remaining following implementation of a remedial action, considering the persistence, toxicity, mobility, and propensity for bioaccumulation of such hazardous substances and their constituents;
- type and degree of long-term management required, including monitoring and operation and maintenance;
- potential for exposure of human and environmental receptors to remaining waste considering the potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment;

- o long-term reliability of the engineering and institutional controls, including uncertainties associated with the land disposal of untreated wastes and residuals; and

- o potential need for replacement of the remedy.

D. Reduction of Toxicity, Mobility or Volume

The degree to which alternatives employ treatment that reduces toxicity, mobility or volume must be assessed. Relevant factors include:

- o the treatment processes the proposed solutions employed and materials they treat;

- o the amount of contaminated materials that will be destroyed or treated;

- o the degree of expected reduction in toxicity, mobility, or volume;

- o the residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity for bioaccumulation of such hazardous substances and their constituents.

E. Short-term Effectiveness

The short-term effectiveness of an alternative must be assessed considering the following:

- o Magnitude of reduction of existing risks; and

- o short-term risks that might be posed to the community, workers, or the environment during the implementation of an alternative including potential threats to human health or the environment associated with excavation, transportation, and redisposal or containment.

F. Implementability

The ease or difficulty of implementing the alternatives are assessed by considering the following factors;

- o Degree of difficulty associated with constructing the solution;

- o expected operational reliability of the treatment technology;

- o need to coordinate with and obtain necessary approvals and permits (or meet the intent of any permit in the case of Superfund actions);

- o availability of necessary equipment and specialists; and

- o available capacity and location of needed treatment, storage, and disposal services.

G. Cost

The types of costs that should be assessed include the following:

- o Capital costs;
- o operation and maintenance costs;
- o net present value of capital and operation and maintenance cost; and
- o potential future remedial action costs.

H. State Acceptance (through the Texas Water Commission)

Evaluation includes assessment of:

- o Components of remedial alternatives that the State supports;
- o features of the alternatives about which the State has reservations; and
- o elements of the alternatives which the State strongly opposes.

I. Community Acceptance

This assessment should evaluate:

- o Components of remedial alternatives that the community supports;
- o features of the alternatives about which the community has reservations; and
- o elements of the alternatives which the community strongly opposes.

EPA is also directed by SARA to give preference to solutions that utilize treatment to remove contaminants from the environment. Offsite transport and disposal without treatment is the least preferred option where practicable treatment technologies are available.

7.2 DESCRIPTION OF ALTERNATIVES

In conformance with the National Contingency Plan (NCP), initial remedial approaches were screened to determine which might be appropriate for this site (see the Sheridan Disposal Services GWM Feasibility Study for details of this evaluation). From these possible remedies, three were chosen for more detailed evaluation and comparison with the remedy selection criteria outlined above. In addition, "No Action" was evaluated to comply with the requirements of the NCP. Each remedy is summarized below.

All of the alternatives have some parts in common. They all require ground water monitoring to track the position of the plume of contamination. Additionally, all alternatives include the use of institutional controls to prevent the use of contaminated ground water. Finally, in the two alternatives which involve ground water treatment, ground water will be treated to meet ARARs and discharged into the Brazos River.

Alternative 1 - Natural Attenuation

This alternative relies on lowering contaminant concentration through natural processes such as sorption, dispersion and biodegradation. Surface water monitoring in the Brazos River will also be conducted to ensure that protective levels are maintained in the river. It will require a minimum of thirty years for contaminants at the upgradient edge of the plume to move through the hydrogeologic system. The cost of this alternative is approximately $326,000.

Alternative 2 - Partial Slurry Wall with Ground Water Treatment

This alternative involves the construction of a 65 foot deep low permeability slurry wall at the downgradient edge of the contamination plume (Figure 6). The slurry wall will intercept contaminated ground water and channel it towards extraction wells located at the center and ends of the slurry wall. Contaminants in the extracted ground water will be treated onsite by passage through a granulated activated carbon (GAC). It is expected to take approximately 25 years for ground water at the upgradient edge of the plume to reach the slurry wall for recovery and treatment. The cost of this alternative is approximately $4.2 million dollars.

Alternative 3 - Recovery Wells with Ground Water Treatment

This alternative involves placement of a line of wells near the downgradient edge of the contamination plume (Figure 7). Ground water will be extracted by these wells and treated onsite by passage through GAC. It is expected to take about 25 years for contaminated ground water at the far edge of the plume to be recovered by the wells and treated. The cost of this alternative is estimated to be about $5.3 million dollars.

It should be noted that the cleanup timeframes described for the alternatives described above are based on the time necessary to move one pore volume of contaminated ground water through the aquifer and do not account for desorption of contaminants bound to the aquifer. These timeframes will be considerable longer (i.e., 90 years) since additional pore volumes of ground water are expected to be necessary to remove contaminants bound to the aquifer.

Alternative 4 - No Action

The No Action alternative does not provide for any capital improvements or other activities to address the ground water contamination. With no action, potential exposure to contaminated ground water is not prevented and potential impacts on the river not controlled. However, Superfund regulations require that this alternative be evaluated as a basis for comparison to other alternatives.

7.3 EVALUATION OF ALTERNATIVES

The following values were assigned to compare remedial selection criteria:

"+" Alternative should exceed a criterion in comparison to other alternatives.
"." Alternative should meet the selection criterion.
"-" Alternative will not meet a criterion, or will not meet a criterion as well as other alternatives.

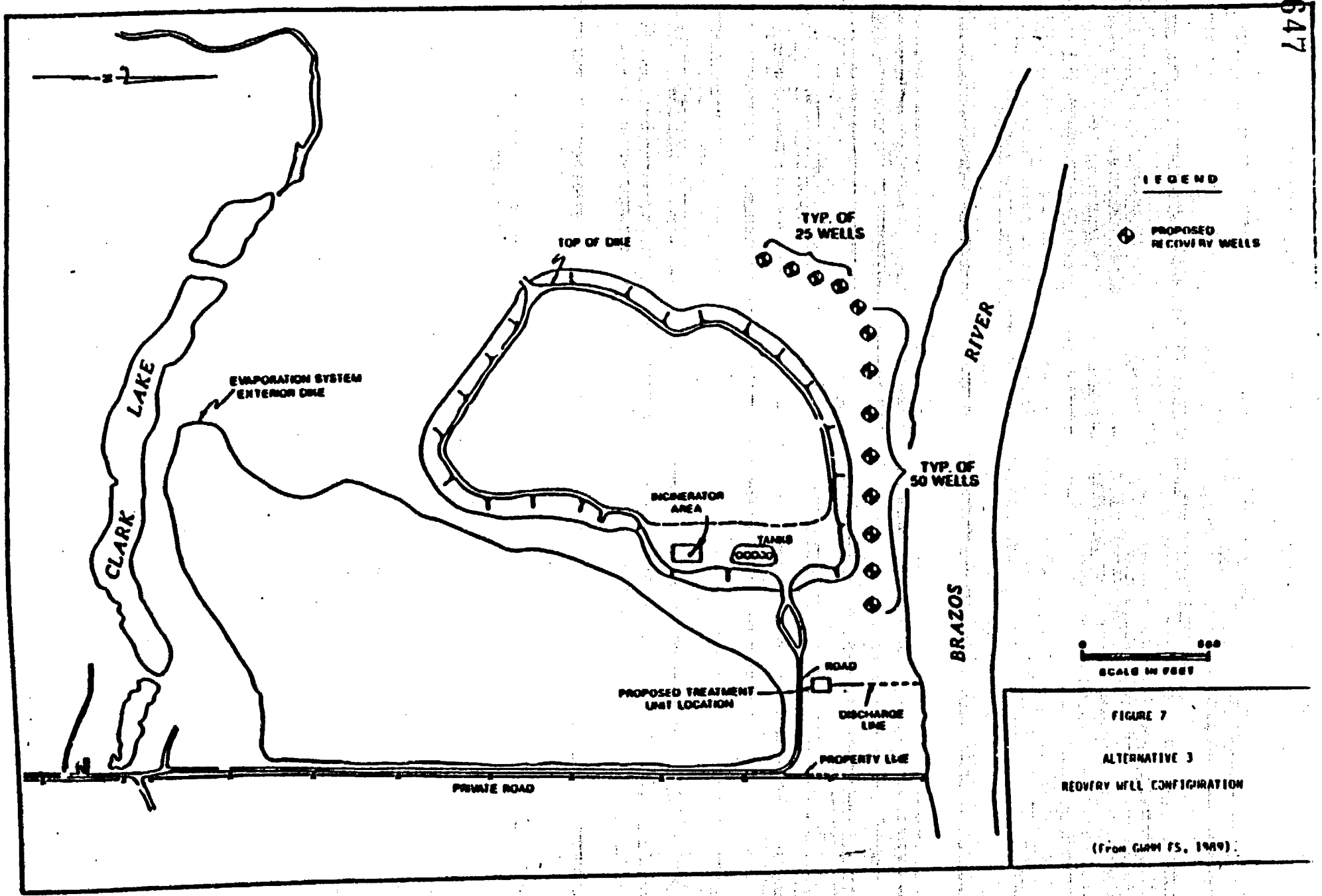

FIGURE 7

ALTERNATIVE 3

RECOVERY WELL CONFIGURATION

(From GIAM FS, 1989).

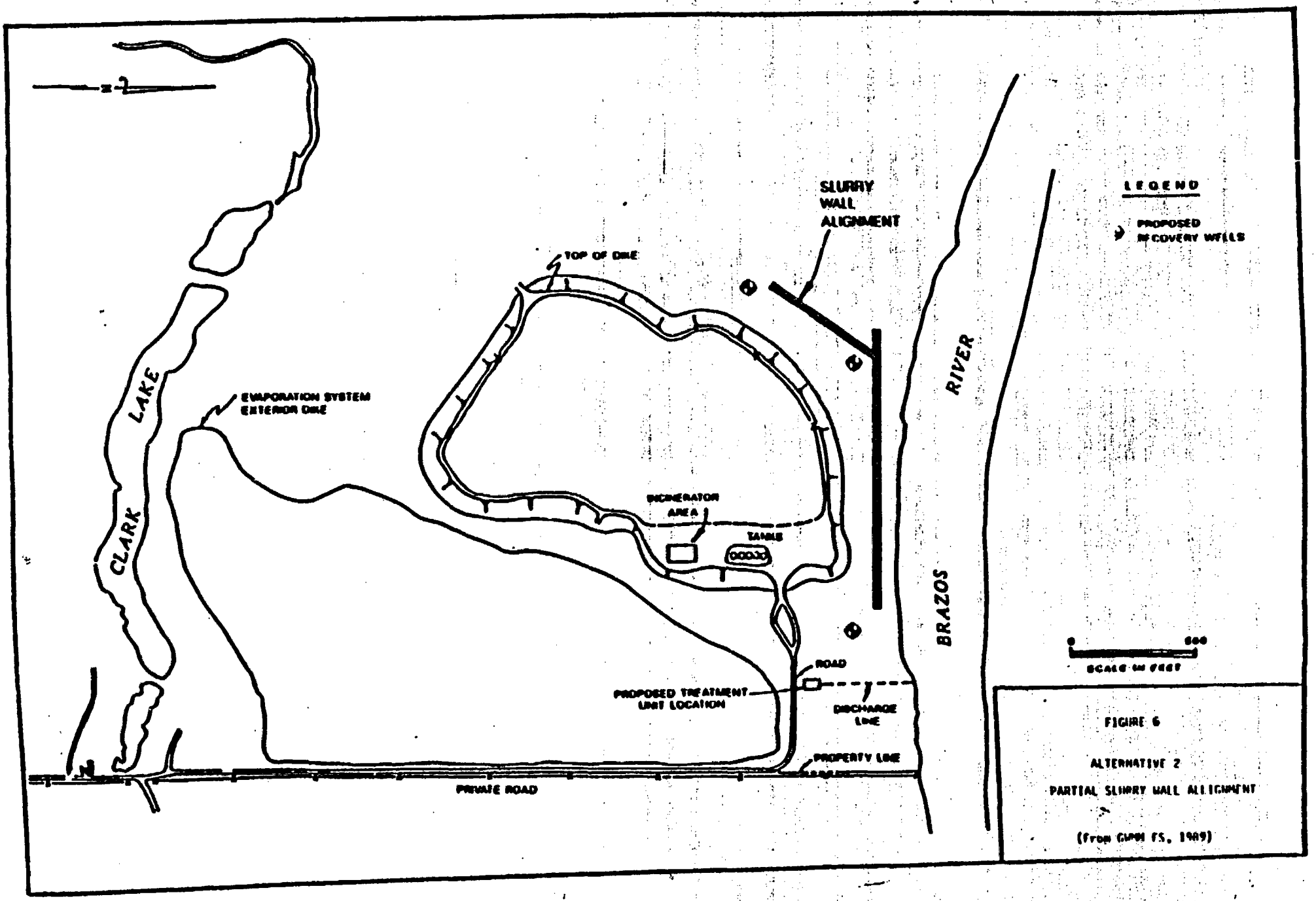

FIGURE 6

ALTERNATIVE 2

PARTIAL SLURRY WALL ALIGNMENT

(From GWM FS, 1989)

The rationale for the ratings assigned each alternative is presented in the following subsections.

A. Compliance with Applicable or Relevant Appropriate Requirements (ARARs) of Other Laws

The No Action Alternative is accorded a rating of "-" due to the inability to monitor the ground water and determine whether ARARs are continuing to be met for the long term. The Alternatives 1, 2, and 3 all meet ARARs and are rated ".".

B. Reduction of Mobility, Toxicity and Volume

The processes of natural attenuation such as biodegradation, sorption and dispersion, may reduce the toxicity, mobility and volume of waste constituents For this reason, Alternatives 1 and 4 are ranked ".". The alternatives which involve ground water recovery (Alternatives 2 and 3) include ground water treatment and thus reduce the mobility, toxicity and volume of the ground water. These alternatives are given a rating of "+". However, it should be noted that at the design flow rate and composition of the treatment scheme proposed for Alternatives 2 and _, less than eight pounds of total contaminants would be removed in the first year and this quantity would very likely decrease with time.

C. Long-Term Effectiveness and Permanence

The No Action alternative is ranked "-" due to the inability to monitor whether ARARs are continuing to be met or prevent the use of contaminated ground water for the long term. In the long-term, the concentrations of constituents will be reduced by natural processes, therefore Alternative 1 is accorded a ranking of ".". Alternatives 2 and 3 will be slightly more effective at reducing the concentrations of constituents in the long-term. Therefore, both 2 and 3 are rated "+".

D. Short-Term Effectiveness

The No Action alternative is ranked "-" due to the inability to prevent ground water use before attenuation takes place. The Natural Attenuation Alternative, for the short-term, is equally effective as Alternatives 2 and 3 since the institution of controls will prevent exposure to contaminated ground water. For this reason, Alternative 1 is ranked ".". However, alternatives 2 and 3 will cause onsite workers to be exposed to additional potential risk since these alternatives include active construction and operation activities. Therefore, Alternatives 2 and 3 are ranked "-".

E. Implementability

Alternative 1 and 4 would be the most easily implemented and are rated "+". Between the remaining alternatives, Alternative 3 is more easily implemented than 2. Alternative 3 is rated ".", since it requires construction of wells and a treatment plant. Alternative 2, partial slurry wall with ground water treatment, is rated "-" due to the difficulties in constructing a slurry wall considering the site constraints. Site constraints include a narrow strip of land for access, the fact that a trench of 65' depth is beyond the

reach of normal trenching equipment and a new working "bench" would need to be constructed.

F. Cost

Table 3 summarizes the cost of the alternatives as developed in detail in Section 6.3 and Appendix C of the feasibility study. Costs are presented as capital, operation and maintenance, present value and total cost. The No Action and Natural Attenuation alternatives (4 and 1) are the least costly alternat and are both ranked "+". Alternative 2 is intermediate in terms of cost and is rated ".". Alternative 3 is the most costly alternative and is therefore rated "-".

G. Overall Protection of Human Health and the Environment

The No Action alternative is ranked "-" due to the inability to prevent potential use of affected ground water and lack of monitoring. Alternative 1 is ranked "." since the seepage of ground water into the Brazos River under current and projected future conditions will result in concentration levels which are protective of human health and the environment. In addition, institutional controls would effectively prevent use of the affected ground water. Alternatives 2 and 3 are equivalent to Alternative 1 in terms of overall protection of human health and the environment and are therefore rated ".". The reasons for this ranking are discussed below:

The shallow ground water recovery rate is relatively low, therefore withdrawal of one pore volume of ground water will require about 25 years. Since extraction of multiple pore volumes would probably be necessary to achieve drinking water criteria (MCLs), it is anticipated that treatment would continue for some multiple of 25 years. During this relatively long time period, the shallow ground water would not meet drinking water criteria and could not be used as such. Institutional controls would be maintained for this period to prevent potable use of the shallow aquifer. Therefore, Alternatives 1, 2 and 3 all require long-term institutional controls to prevent use of the shallow aquifer.

H. Community Acceptance

The community has voiced limited support for the Natural Attenuation alternative and has not expressed any concerns about the alternative. Therefore natural attenuation is rated "+" and all other alternatives are rated ".".

I. State Acceptance

The State of Texas, through the Texas Water Commission, has indicated that they have no objection to the selected alternative. Therefore, Natural Attenuation is rated "+" and all remaining alternatives are rated "0".

J. Summary of Comparative Analysis

As described above, alternatives 1, 2 and 3 are fully protective of public health and the environment. All of the alternatives except No Action could also be implemented to comply with all ARARs. With regard to the balancing

TABLE 3

Alternative Costs (in thousands)

Alternative	Capital Cost	Operation and Maintenance	Present Value Cost	Total Cost
1. Natural Attenuation	-0-	$326	$194	$326
2. Partial Slurry Wall with Ground Water Treatment	$850	$3,346	$2,428	$4,196
3. Recovery Wells with Ground Water Treatment	$1,095	$4,234	$3,073	$5,329
4. No Action	-0-	-0-	-0-	-0-

criteria, alternatives 2 and 3, make a slight reduction of toxicity of the affected ground water, but the reduction is very small, and the resulting decrease in surface water concentrations would not be detectable. Furtnermore, these alternatives concentrate waste constituents on GAC, which must eventually be disposed of. The more costly alternatives (Alternatives 2 and 3), are generally more difficult to implement and may pose more short-term risks to onsite workers. Finally, Alternatives 2 and 3 will not appreciably decrease the time necessary to achieve MCLs.

VIII. SELECTED REMEDY

Based on the information provided in the administrative record and the results of the evaluation of alternatives (Section 5.3), the "final" remedy has been selected. It is EPA's judgement that Alternative 1, Natural Attenuation, best satisfies both the statutory and selection criteria in comparison to the other alternatives evaluated in this document. This remedy is consistent with the remedy selected for the Source Control operable unit.

8.1 DESCRIPTION OF SELECTED REMEDY

A. Establish Alternate Concentration Limits (ACLs) as the Ground Water Protection Standard

EPA has selected ACLs as the apprpriate ground water standard for the site as long as the conditions set forth below remain valid. ACLs are ground water protection standards that are used to assure that hazardous constituents found in the ground water do not pose a risk to human health or the environment. To ensure that ACLs remain protective, the following conditions must continue to be met at the site:

a. The Brazos River must remain the discharge point for ground water from the site.

b. The Brazos River cannot be adversely impacted by the discharge of contaminated ground water into the river. Presently, no adverse impacts to the river from the site have been observed. To ensure that future adverse impacts from the site do not occur at the point of exposure for environmental receptors in the river, river water will be sampled to ensure that there is no statistically significant increase in contamination, as compared to upgradient locations.

c. The ground water use restrictions outlined below must be implemented and continued to ensure that affected ground water is not consumed and the integrity of the Brazos River as a hydraulic barrier to ground water flow is maintained.

If any of these conditions change, the situation will be reevaluated and appropriate action taken. The specific provisions for setting the ACLs are outlined below.

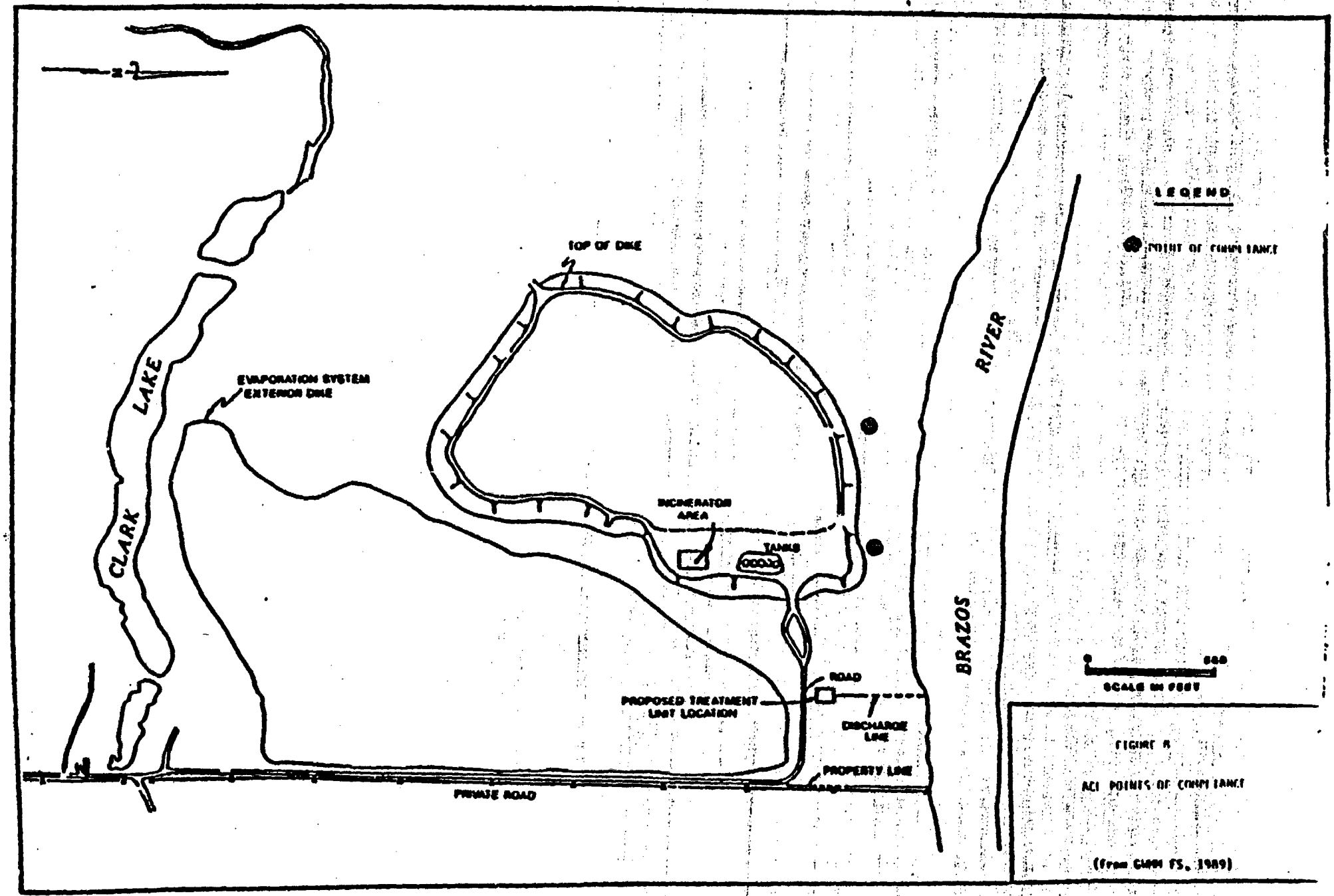

FIGURE 6

ACI POINTS OF COMPLIANCE

(From CH2M HS, 1989)

ACL Contaminants and Concentrations

EPA has set ACLs for the contaminants detected in the ground water in order meet drinking water criteria in the Brazos river. These values were calculated by determining the volume of affected water entering the river at any time and factoring in the dilution which would occur in the river at historical low flow conditions.

These ACLs are listed below:

Compound	ACL (ppm)
Benzene	26
Tetrachloroethylene	41
Trans-1,2 dichloroethylene	26
Trichloroethylene	26
Arsenic	260

If additional contaminants are detected in the ground water in the future, ACLs will be developed for them using the methodology described in the F.S.

Point of Compliance

The point of compliance is the location where ACLs must be met and is also the well location where ACLs are monitored. At the point of compliance, ACLs will be met at concentrations that ensure that human health and the environment are protected at the point of exposure and that no statistically significant increase in contamination occurs in the river.

The specific locations for the point of compliance monitoring, based on the existing position of the ground water plume, are around the boundary of the lagoon and are designated as well numbers 34 and 35 as illustrated in Figure 8. If the plume position changes additional compliance points may be identified.

Point of Exposure

A point of exposure is a location where environmental or human receptors may be exposed to or use ground water. Exposure to ground water at that point cannot result in an endangerment to human health or the environment. At the Sheridan site, the point of exposure will be the interface of ground water and the Brazos River (i.e., where offered ground water comes into contact with the river). It will be monitored by the collection of water samples from the Brazos River at the projected point, or points of entry of affected ground water from the site.

Ground Water Use Restrictions

Ground water use at the site will be restricted to ensure that contaminated ground water is not consumed and that the hydraulic barrier that the Brazos River provides is not affected. Ground water use onsite will be restricted within a minimum of 100 feet from the edge of the plume of contaminated ground water. In addition, the use of any well (other than that employed as part of a corrective action) which could potentially affect the size or position of the plume of ground water contamination is prohibited.

The ground water use restrictions which will be implemented are deed notices recorded in the county clerks office. These restrictions are expected to be reliable and effective for the following reasons.

1. The area of attainment (ground water contamination plume exclusive of the area beneath the lagoon) is limited to a narrow strip of land between the waste lagoon and the river, and is located entirely onsite, on the land owner/former operator's property.

2. The yield of the aquifer is too low to be of agricultural use, which is the most likely potential use.

3. The land owner/former operator is a signatory to a proposed Consent Decree which states that he will not take any actions at the site without getting prior written Consent from EPA. In addition, the terms of any sale of the site property must contain a provision requiring compliance with the consent decree.

4. There will be, at the minimum, annual monitoring of site conditions to verify that the restrictions are effective.

EPA has enforcement authority to ensure that the remedy selections for the source control and GWMM operable units are implemented and that no one interferes with remedy implementation. If any of the conditions listed above should change, the existing situation will be evaluated and appropriate action will be taken to prevent potential use of contaminated ground water.

Ground Water Monitoring

Ground water will be monitored to ensure compliance with ACLs and the three conditions listed at the beginning of Section 8.1. Compliance monitoring will be conducted quarterly for the first year. The frequency of monitoring may then be modified by EPA.

The first time an ACL for a particular contaminant is exceeded, the well will be resampled. If the second analysis confirms that the ACLs are being exceeded, EPA will determine whether the corrective action program outlined below will be implemented.

Finally, additional wells will be monitored quarterly to ensure that the Brazos River continues to act as a discharge point and hydrological barrier to ground water flow. The monitoring frequency of these wells may be modified by EPA.

Surface Water Monitoring

The surface water from the Brazos River will be monitored to ensure that there is no statistically significant increase in contamination due to the ground water recharge to the River. Samples will be obtained in the river immediately adjacent of the point of projected entry of effected ground water and upgradient of the site.

B. Corrective Action and Contingency Planning

In the event ACLs are exceeded, if any of the three conditions outlined at the beginning of section 8.1.A. are not met, or if changes in receptors

40 C.F.R. §264.100 will be implemented. As part of the design of the remedial action, a corrective action contingency plan will be developed. Under the corrective action program, contaminated ground water will be extracted and treated, or other necessary and appropriate action will be undertaken, to reduce contaminant levels to ensure that ACLs are not exceeded at the compliance point and that the remedy is protective of human health and the environment at the point of exposure.

If ground water needs to be treated at the site, different process options, including a combination of treatment technologies, will be considered during the design of the treatment system. The process presented in the FS for the pump and treat alternatives is one possible process configuration that could be utilized. During design of the treatment system, the particular tecology or technologies will be chosen on the basis of performance goals that EPA sets for the treatment system.

C. Monitoring, Operation and Maintenance (MOM)

1. The site will be secured to meet the requirements of 40 C.F.R. §264.14 during post-closure.

2. The ground water monitoring system will be monitored and maintained to comply with the requirements of 40 C.F.R. Part 264, Subpart F.

3. A written MOM plan will be developed to define the activities which will be necessary to ensure the remedy will continue to be effective.

Additionally, because hazardous substances will remain on-site, EPA will re-evaluate this site at least once every five years after the commencement of the remedial action to assure that human health and the environment continue to be protected.

8.2. RATIONALE FOR SELECTION OF THE REMEDY

In accordance with Section 121 of CERCLA, to be considered as a candidate for selection, an alternative must be protective of human health and the environment and attain ARARs. For ground water, attainment of ARARs requires that a ground water protection standard be set at either Maximum Contaminant Levels (MCLs), ACLs or at background levels. To meet the ground water protection standards, both pump and treat and natural attenuation alternatives were evaluated.

Because Alternative #4, No-action, is not protective and does not attain ARARs, it was rejected from further consideration.

The remaining three alternatives, which utilize natural attenuation or ground water recovery and treatment, all meet the statutory threshold criteria of protectiveness and attainment of ARARs. To select among them, EPA focused on other criteria, including: short-term effectiveness, long-term effectiveness, implementability, reduction of mobility, toxicity or volume of waste, community acceptance and State acceptance.

The advantages of the ground water recovery and treatment alternatives is that they will achieve safe levels more quickly and utilize treatment to permanently

reduce the toxicity of contaminants. However, the magnitude of these potential benefits is quite small; the cleanup timeframes are estimated to be about 10-15% (i.e., 75 vs. 90 years) faster than for natural attenuation, and a maximum of eight pounds per year of total contaminants will be treated annually by sorption onto GAC.

The first disadvantage of the ground water recovery and treatment alternatives (Alternatives 2 and 3) is that their operation and maintenance poses greater potential short-term risk to on-site workers during construction and operation of the extraction and treatment systems. Second, Alternative 3 (recovery wells) and to an even greater extent alternative 2 (partial slurry wall), are more difficult to implement than natural attenuation. Third, the costs of alternatives 2 and 3 are between ten and twenty times greater than the costs of natural attenuation. Finally, the State and the community have expressed limited support of the natural attenuation alternative. In light of these considerations, EPA has determined that Alternative 1, Natural Attenuation, best satisfies the nine criteria for remedy selection.

As discussed in the description of the Selected Remedy, the natural attenuation alternative requires the implementation and enforcement of ACLs as the appropriate ground water protection standard for ground water in the area of attainment. The rationale for selection of this standard is described in the paragraphs which follow.

Under RCRA regulations, the ground water protection standard establishes a safe level of contamination in ground water in the vicinity of a waste disposal site. Under these regulations, the protection standard can be set at MCLs, ACLs, or at background levels. ACLs are based on the premise that, although ground water is contaminated around a waste disposal site, at a point where a potential receptor may come into contact with ground water, levels of contaminants are not found at unsafe levels. At locations where exposure to ground water may not be safe, enforceable controls to prevent exposure may be implemented. At the Sheridan site, that basic premise is satisfied. Ground water around the site is contaminated, however, the river and other site features contain and attenuate contamination in the ground water to protective levels and enforceable controls can be implemented.

In addition to the RCRA requirements, under Section 121(d)(2)(B)(ii) of CERCLA, 42 U.S.C. §9612(d)(2)(ii), EPA may not establish ACLs as the ground water protection standard for a Superfund site if human exposure to hazardous constituents will occur beyond the site boundary (as that boundary is defined in the RI/FS), unless EPA had determined that:

a. there are known or projected points where the ground water will enter into the surface water;

b. there is or will be no statistically significant increase in the level of hazardous constituents in the surface water at the points of entry of contaminated ground water into the river.

c. the remedial action includes enforceable remedial measures to preclude human exposure to ground water between the site boundary and all known or projected points of entry.

The RCRA requirements and the CERCLA prerequisites for an ACL are met at the Sheridan site because of the following reasons:

1. The ground water characterization study completed in the RI concluded the Brazos River is a hydraulic barrier. Contaminated ground water from the site discharges into the river. Thus, there are known or projected points where site ground water will enter into the river.

2. Sampling and analysis conducted by EPA indicates that the Brazos River acts as a hydrologic barrier that will tend to dilute and disperse contaminants. Sampling also indicates that there is no statistically significant increase in hazardous constituents in the river which can be attributed to the site.

3. Ground water that is contaminated by the site is not currently used as a source of drinking water. Deed recording, when applied in conjunction with the assumptions described in Subsection 6.1.A., will be used to ensure that contaminated ground water is not consumed.

4. Because the impermeable cap required by the Source Control ROD will prevent infiltration of rainwater into the waste lagoon, flushing of lagoon contaminants into ground water will be significantly decreased in the long-term.

5. The setting of ACLs for individual contaminants at the points of compliance will ensure that human and environmental receptors are not exposed to unsafe levels of contaminants at the points of exposure. In the event an ACL for an individual contaminant is exceeded, corrective action at the site will be implemented consistent with Section 6.1. Thus, setting ACLs provides EPA with an enforceable mechanism that sets into motion corrective action.

ACLs will be effective and protective of human health and the environment in the long-term. Although the development of ACLs as the ground water protection standard will not reduce contaminants in ground water, their enforcement will ensure protection of public health and the environment at each and every point of exposure. Further, the corrective action program will ensure that the remedy continues to be effective.

Alternatives 2 and 3 which call for pumping and treating ground water, are no more protective than the selected remedy because they will still require the implementation of controls to prevent the use of ground water until safe levels are met. Furthermore, site conditions may prevent the attainment of MCLs within a reasonable timeframe. These conditions include 1) the potential for continued leaching of contaminants sorbed to the aquifer (particularly clay layers) 2) the low hydraulic gradient across the site and the potential that capping the lagoon area as required by the Source Control ROD may further reduce these gradients, and 3) the low yield and small radii of influence of pumping wells in the affected aquifer. In view of these conditions, EPA has determined that cleanup to MCLs is not practicable. Therefore, the development and enforcement of ACLs is necessary. However, pumping and treating ground water may be implemented under the corrective action plan to ensure that ACLs are not exceeded.

IX. STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions which are protective of human health and the

environment. In addition, Section 121 of CERCLA established several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

9.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment through the implementation of ground water use restrictions on-site and the enforcement of ACLs to ensure safe levels are maintained at the first point of potential exposure in the Brazos River. The implementation of the selected remedy will effectively reduce any potential excess cancer risk associated with ingestion of contaminated ground water.

9.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The selected remedy will attain all applicable or relevant and appropriate federal and state environmental requirements at the site. Federal environmental laws that are applicable or relevant and appropriate to the selected remedial action at the site include the:

- Resource Conservation and Recovery Act (RCRA);
- Clean Water Act (CWA);
- Safe Drinking Water Act (SDWA); and
- Executive Order 11988 (Floodplain Management)

State environmental laws that are applicable or relevant and appropriate to the selected remedial action at the site are:

- Texas Clean Air Act; and
- Texas Administrative Code Relating to State Water Quality Standard

A discussion of how the selected remedy meets those requirements follows.

Ground Water

RCRA ground water protection standards (GWPS), 40 C.F.R. Part 264, Subpart F, are established for constituents entering ground water from a regulated hazardous waste unit. Although RCRA is not applicable to the Sheridan site, the waste lagoon presents problems that are similar to those that the requirements address, and thus, the requirements are relevant and appropriate. Ground water protection standards under the RCRA regulations are set at MCLs, ACLs, or at background levels. Because the Brazos River acts as a hydrologic barrier for site ground water, EPA has determined that ACLs are the relevant and appropriate standards at the site. If hydrogeologic conditions at the site change significantly and contaminated ground water was to no longer discharge to the Brazos then MCLs, promulgated pursuant to the Safe Drinking Water Act, are ARARs. These standards

are relevant and appropriate for ground water at the point where exposure to ground water may occur.

Surface Water

The reach of the Brazos River adjacent to the site is classified by the State as suitable for public water supply and recreational use. Therefore, MCLs and State and Federal Water Quality Criteria promulgated pursuant to the Clean Water Act are relevant and appropriate in the Brazos River. Further, all actions will meet the applicable requirements of 31 Texas Administrative Code Sections 329, 21-29, 307.1 to 307.10. Finally, if corrective action is required, all discharges will be treated to satisfy the requirements of the Clean Water Act application of best available technology (BAT) and best conventional technology (BCT).

Air

If a corrective action is required, the treatment facility will be designed to meet the requirements of Section 4.01 of the Texas Clean Air Act.

Post-Closure Care

Monitoring of ground water will be conducted in accordance with the relevant and appropriate RCRA ground water monitoring requirements under 40 CFR Part 264, Subpart F. In addition, site reviews will be conducted at least once every five years to ensure that the remedy is continuing to be protective of human health and the environment.

Corrective Action and Contingency Planning

If a ground water corrective action becomes necessary then these activities will be conducted in accordance with the corrective action regulations 40 CFR Section 264.100. Such action will also be conducted in accordance with any relevant and appropriate requirements of the general facility standards in 40 CFR part 264, Subpart B.

9.3 COST-EFFECTIVENESS

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth value being $194,000. It is the least costly alternative which is fully protective of human health and the environment and attains ARARs.

9.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the GWMM operable unit at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the natural attenuation alternative provides the best balance of tradeoffs in terms of balancing and modifying criteria for remedy selection. As described in section 6.2, it is not practicable to treat ground

APPENDIX B

SHERIDAN DISPOSAL SERVICES
COMMUNITY RELATIONS RESPONSIVENESS SUMMARY

This Community Relations Responsiveness Summary has been prepared to provide written responses to comments submitted regarding the proposed plan of action for the ground water portion of the Sheridan Disposal Services hazardous waste site. The Summary is divided into two sections:

Section I. Background of Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during the remedial planning activities at the Sheridan site.

Section II. Summary of Major Comments Received. Any written or oral comments are summarized and EPA's responses are provided.

I. Background

In general, there has been a long history of citizen awareness of the Sheridan Disposal Services site. In the early 1970s when incineration at the site resulted in air emissions, people living within a 7-mile radius complained. In 1971 a citizens' group submitted a petition with over 500 signatures to the Texas Water Quality Board calling for its closure. However, community concerns of either the area residents or local officials are now very low, probably because the site has been inactive since 1984. Also the site is relatively remote and there are no residences within a mile.

II. Summary of Major Comments Received

The proposed plan fact sheet announcing the public comment period and opportunity for a public meeting for the ground water portion of the site was distributed on July 31, 1989. The comment period began on August 14, 1989 and ended on September 11, 1989. No one responded to the offer of a public meeting and none was held. No written comments or questions were received by EPA.

019672

APPENDIX C

Garcia
Tipple
Feeley
Ferguson
Eden
Beinke
1400GG04.LTR

September 22, 1989

Allyn M. Davis, Ph.D., Director
Hazardous Waste Management Division
U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Re: Sheridan Disposal Service Superfund Site
Draft Record of Decision
Ground Water Migration Management Operable Unit

Dear Dr. Davis:

We have reviewed the proposed Record of Decision (ROD) for the Sheridan Disposal Service Superfund site. We have no objection to the selected remedy for the Ground Water Migration Management Operable Unit as described in the draft ROD of September 15, 1989. The selected remedy described as the natural attenuation alternative requires the establishment of Alternate Concentration Limits (ACLs), ground water monitoring, sampling and analysis of the Brazos River, implementation of controls to preclude the use of contaminated ground water, and implementation of a corrective action plan in the event that ACLs are exceeded at some time in the future.

Sincerely,

Allen Beinke
Executive Director

STATEMENT OF WORK FOR REMEDIAL DESIGN AND REMEDIAL ACTION

GROUND WATER OPERABLE UNIT

SHERIDAN DISPOSAL SERVICES SITE
HEMPSTEAD, TEXAS

Prepared for:

The Sheridan Site Trust

W.O. #91-21

January 12, 1990

Prepared By:

ERM-SOUTHWEST, INC.
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STATEMENT OF WORK FOR REMEDIAL DESIGN AND REMEDIAL ACTION

GROUND WATER OPERABLE UNIT

SHERIDAN DISPOSAL SERVICES SITE HEMPSTEAD, TEXAS

1 - INTRODUCTION

1.1 Scope and Background

The Sheridan Site Committee performed the Second Operable Unit Ground Water Migration Management (GWMM) Remedial Investigation and Feasibility Study for the Sheridan site under an agreed administrative order issued in December of 1986. The GWMM Remedial Investigation identified the extent and degree of affected ground water beneath the site, along with the hydrologic conditions at the site. The GWMM Feasibility Study identified and evaluated a range of alternatives for remedial action at the site. Upon review of these alternatives, EPA selected the natural attenuation alternative as the remedial action for the site in a Record of Decision (ROD) issued on September 27, 1989.

The selection of natural attenuation as the remedial action for the ground water operable unit includes the establishment of alternate concentration limits (ACLs) for the constituents found in the ground water, and the use of institutional controls to restrict access and use of potentially affected ground water. The ACLs identified for the site are listed in Table 1-1.

The natural attenuation alternative for the GWMM operable unit is a portion of the overall site remediation which includes the Source Control (first operable unit) remedial alternative of biotreatment and stabilization of sludges, placement of treated materials under a RCRA-compliant cap, erosion control along the Brazos River, ground water monitoring and institutional controls.

1.2 Objectives

The objectives of the Statement of Work are to define the scope of activities necessary to meet the objectives stated in the ROD and to protect human health and the environment. The objectives are as follows:

- to ensure that ACLs are met in the ground water;

TABLE 1-1

Alternate Concentration Limits (ACLs)
for the Shallow Ground Water Aquifer

Sheridan Disposal Services Site
Hempstead, Texas

COMPOUND	ACL (ppm)
Benzene	26
Tetrachloroethylene	41
Trans-1,2-Dichloroethylene	26
Trichloroethylene	26
Arsenic	260

- to ensure that the Brazos River is not adversely affected by ground water discharge from the site;
- to ensure that the Brazos River is always a discharge point and remains a hydraulic barrier for the affected ground water;
- to ensure that institutional controls remain in effect; and
- to ensure that if ACLs are exceeded, a Remedial Action Plan is implemented, and that the protection of human health and the environment is maintained.

1.3 Technical Approach

The technical approach to the remedial design for the ground water operable unit includes the following activities:

- periodic sampling of a system of monitoring wells and measurement of water levels;
- periodic sampling of water from the Brazos River;
- periodic site visits and annual site inspections; and
- preparation/implementation of a Remedial Action Plan, if necessary.

Ground water sampling for constituents of concern at the site will determine the presence and concentration of constituents, and if ACLs are being approached or exceeded. The measurement of water levels at the site will be used to determine the ground water flow direction and gradient to ensure that the Brazos River is the receptor of ground water from the site. Sampling of water from the Brazos River will ensure that there is no impact on the river from the ground water. Annual site inspections will ensure that institutional controls are being maintained and that the condition of other remedial design elements, such as the monitoring wells, remain in operating condition.

A Remedial Action Plan (RAP) will be prepared and submitted to EPA for approval if concentrations of constituents in the ground water reach the trigger levels for remedial action listed in Table 4-1. The Remedial Action Plan will be implemented if ACLs are exceeded in the ground water.

2.1 General Approach

The activities specified in the Ground Water SOW will be combined with the ground water sampling for the Source Control operable unit. These activities, such as the ground and surface water sampling, will begin upon submittal of the Source Control final report to the EPA. During source control construction activities, the shallow ground water aquifer will be sampled on a semi-annual basis utilizing the same procedures as outlined for the pilot biotreatment study monitoring.

2.2 Pre-sampling Activities

Prior to the initial round of ground water sampling, monitor wells proposed to be sampled and/or used for ground water level measurements will be evaluated for adequacy.

These wells will be surveyed for top-of-casing (TOC) elevations. The elevations will be tied to the permanent survey monuments that will be established as part of the design and construction of the cap (Source Control SOW). Elevations will be measured to an accuracy of 0.01 feet, and be recorded relative to the USC and GS 1983 North American datum. The purpose of the survey is to accurately establish the TOC elevations for ground water level monitoring. Because the ground water gradients are very shallow at the site, accurate knowledge of the water level elevation is necessary to define ground water flow directions and gradients. Monitor wells may move or shift slightly due to age and other site activities associated with cap construction, and therefore it is necessary to resurvey the TOC elevations subsequent to cap construction.

In addition to the TOC survey, wells will be visually inspected to check the integrity of the protective steel casing, the concrete pad, the PVC riser pipe and the total depth of the well. If the concrete pad is cracked or if the protective steel casing is loose or unable to be locked, the pad and/or casing will be repaired or replaced, as appropriate.

If the PVC riser pipe is found to be loose, the cause of the condition will be determined, if possible. If the integrity of the seal around the riser pipe is in question, the well may have to be replaced.

The total depth of the well will be measured using a weighted tape or a similar device. The instrument will be thoroughly decontaminated between each well location. If the well is found to be

"silted in", where the sump or any portion of the well screen is filled with silt or clay-sized particles, the well will be redeveloped. Development will be accomplished through bailing, pumping or surging, as appropriate. Distilled water may be added, if necessary, to facilitate the removal of fine material from the well. The well will be developed until the pH, specific conductance and water clarity stabilize. Water will be temporarily stored in 55-gallon drums on site. If the analytical results show constituent concentrations to be below ACLs, then the development water will be poured on the ground surface. If the well(s) continue to silt in after redevelopment, the need for replacement wells will be evaluated.

2.3 Ground Water Sampling

2.3.1 Rationale for Choice of Monitoring Wells

In accordance with the ROD, both the shallow unconfined aquifer and the deeper confined aquifer will be monitored for the constituents specified in Tables 2-1 and 2-2. The wells chosen for the shallow aquifer, contingent on satisfactory evaluation, are:

- o upgradient locations -- MW-12 and MW-10,
- o downgradient locations -- MW-31, MW-32, MW-34, MW-36, MW-37, and MW-18.

The approximate well locations are shown in Figure 2-1. These wells were chosen for monitoring purposes because they intercept the plume in the downgradient direction of ground water flow (to the north-northwest), the upgradient wells are away from the source area, the downgradient wells screen the entire zone of the aquifer, including the top of the water table, and all of the above wells (except MW-18) were used to define the extent and concentration of constituents in the plume in the Remedial Investigation.

Although the deeper, confined aquifer is hydraulically separated from the shallow aquifer by an upward gradient, the deeper aquifer will be monitored to ensure that it remains free from constituents found in the shallow aquifer. The wells to be monitored, contingent on satisfactory evaluation, are:

- o upgradient location -- MW-40
- o downgradient locations -- MW-30, MW-33 and MW-35.

The well locations are also shown in Figure 2-1. The wells are suitable for monitoring because they are screened across the entire thickness of the confined zone, the well locations are correctly

TABLE 2-1

Target Compound List (TCL)

Volatiles

Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane/Methyl bromide
2-Butanone
Carbon disulfide
Carbon tetrachloride
Chlorodibromomethane
2-Chloroethylvinyl ether
Chlorobenzene
Chloroethane
Chloroform
Chloromethane/Methyl Chloride
1,1-Dichloroethane
1,1-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylbenzene
2-Hexanone
Methylene chloride
4-Methyl-2-pentanone
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Vinyl acetate
Vinyl chloride
Xylenes

Semivolatiles

Acenaphthene
Acenaphthylene
Anthracene
Benzo[a]anthracene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[ghi]perylene
Benzo[a]pyrene
Benzoic Acid
Benzyl alcohol
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl ether)
Bis(2-ethylhexyl)phthalate
4-Bromophenyl phenyl ether
Butyl benzyl phthalate
p-Chloroaniline
p-Chloro-m-cresol
2-Chloronaphthalene
2-Chlorophenol
4-Chlorophenyl phenyl ether
Chrysene
m-Cresol
p-Cresol
Di-n-butylphthalate
Dibenz[a,h]anthracene
o-Dichlorobenzene
m-Dichlorobenzene
p-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
Diethyl phthalate
2,4-Dimethylphenol
Dimethyl phthalate
4,6-Dinitro-o-cresol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octyl phthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorocyclopentadiene
Hexachloroethane
Hexachlorobutadiene
Indeno(1,2,3-cd)pyrene
Isophorone
2-Methylnaphthalene
Naphthalene
o-Nitroaniline
m-Nitroaniline
p-Nitroaniline
Nitrobenzene
o-Nitrophenol
p-Nitrophenol
n-Nitrosodimethylamine
n-Nitrosodiphenylamine
n-Nitrosodi-n-propylamine
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

TABLE 2-1 (Cont'd)

Target Compound List (TCL)

Pesticides/PCBs

Aldrin	Endrin
alpha-BHC	Endrin Ketone
beta-BHC	Heptachlor
gamma-BHC (Lindane)	Heptachlor epoxide
delta-BHC	Methoxychlor
Chlordane	PCB-1242
4,4'-DDT	PCB-1254
4,4'-DDE	PCB-1221
4,4'-DDD	PCB-1232
Dieldrin	PCB-1248
Endosulfan	PCB-1260
Endosulfan II	PCB-1016
Endosulfan sulfate	Toxaphene

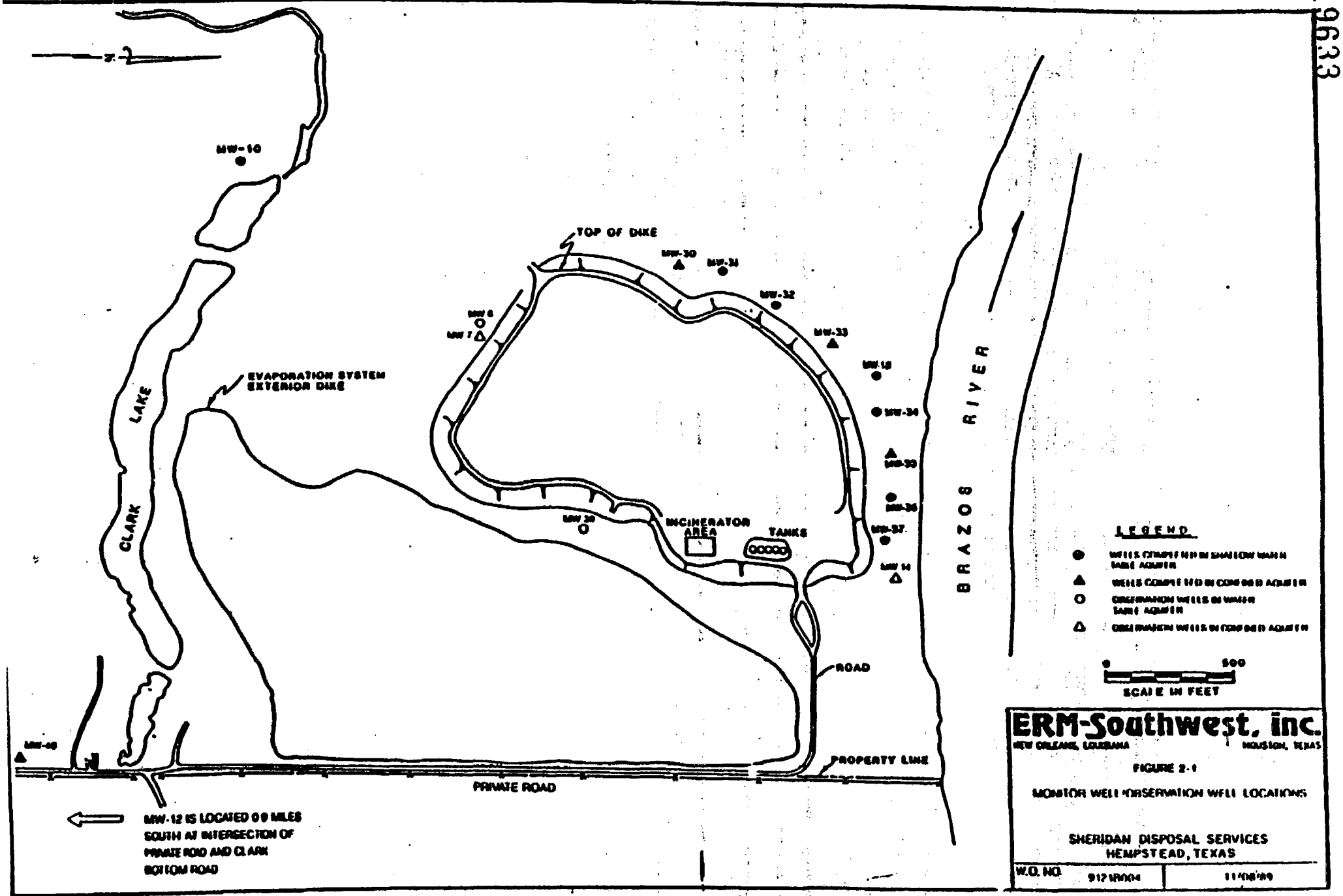
TABLE 2-2

Target Analyte List (TAL)

Metals [a]	
Arsenic	Mercury
Barium	Nickel
Cadmium	Selenium
Chromium	Silver
Lead	Zinc

NOTE:

[a] The metals listed here are site-specific and are only a portion of the metals on the TAL.



ERM-Southwest, inc.
NEW ORLEANS, LOUISIANA — HOUSTON, TEXAS

FIGURE 2-1

MONITOR WELL/OBSERVATION WELL LOCATIONS

SHERIDAN DISPOSAL SERVICES
HEMPSTEAD, TEXAS

W.O. NO.	912/R004	11/08/89

placed (upgradient and downgradient), and these wells were used during the Remedial Investigation to show that the ground water in this zone was not affected.

The frequency of ground water sampling for both the shallow and deep aquifers will be as follows: quarterly for the first year following completion of site construction, semi-annually for years two through five, annually for years six through ten, and every five years thereafter. The selected monitoring wells will be evaluated periodically for adequacy, and replaced if deemed inadequate. Details of the criteria for adequacy of wells will be provided in the Monitoring, Operation and Maintenance (MOM) Plan.

The frequency of ground water monitoring will be modified if the monitoring results show that concentrations exceed a trigger level of approximately 4% of the ACL (rounded to the nearest ppm). These trigger levels are listed in Table 2-3. If a constituent reaches a trigger level, the well(s) will be resampled for that constituent to confirm the initial result. If the trigger level is not exceeded during the confirmatory sampling, the well(s) will be resampled the following quarter for constituents of concern. Again, if the concentration is below the trigger levels, the well sampling schedule will resume its original schedule.

The frequency of sampling will be increased to quarterly if the well(s) exceed trigger levels during confirmatory sampling or during two successive quarters as described above. Only wells which exceed the trigger levels will be sampled, and only for those constituents which exceed the trigger level. The quarterly sampling will continue for four consecutive quarters. If the concentration stabilizes, as shown by graphical analysis, then the sampling will resume at the same frequency as for wells with constituent concentrations below trigger levels.

The frequency of ground water monitoring will also be modified if an analysis of the change in constituent concentration with time shows that concentrations could be within 80% of the ACL prior to the next scheduled sampling event. If this occurs, the next sampling event will be rescheduled to coincide with the projected time when the ground water trigger levels in Table 2-3 would be reached. If sampling results indicate that trigger levels are exceeded, sampling would take place on a quarterly basis for those wells which exceed trigger levels, as described above. The method of data analysis is described in Section 3.

TABLE 2-3

Trigger Levels for Increased Frequency
of Ground Water Monitoring

Sheridan Disposal Services Site
Hempstead, Texas

COMPOUND	TRIGGER LEVEL (ppm)
Benzene	1
Tetrachloroethylene	2
Trans-1,2-Dichloroethylene	1
Trichloroethylene	1
Arsenic	10

2.3.2 Analytical Methods

The analytical methods to be used to quantify constituents in the ground water will be the EPA Contract Laboratory Program (CLP) procedures. Samples will be analyzed for the volatile, semi-volatile and pesticide/PCB fractions as listed on the Target Compound List (TCL) shown in Table 2-1. Selected metals from the Target Analyte List will also be analyzed (Table 2-2). The compound lists are specified by the EPA for use with CLP procedures.

In addition to the CLP procedures, pH, specific conductance and temperature of the ground water will be measured at the time of sampling.

2.3.3 Sampling Procedures

The procedures for ground water sampling will be similar to those followed for the GWMM Remedial Investigation. Before each well is sampled, a minimum of three casing volumes of water will be removed. The minimum volume of water to be evacuated is determined by measuring the height of the water column in the well in feet and multiplying that value by $0.489*r^2$, where r is the radius of the well in inches. The total depth of each well will also be checked using a weighted tape or similar device. The specific conductance (SC) and pH will be monitored periodically during purging. Purging will be considered complete when pH and SC stabilize and a minimum of three volumes have been removed from the well.

Water is purged from the wells using dedicated bailers. Bailers are constructed of PVC with nylon rope. During bailing and sampling, plastic sheeting will be placed around the well on the ground to keep the bailer rope clean and free from surface contamination. Ground water removed from wells adjacent to the site will be collected in 55 gallon drums. Water may be disposed of on the ground surface provided levels of detected constituents are below ACLs.

Wells will be sampled with the same bailer used during purging. The bailer will be carefully lowered into the well and allowed to fill. A teflon bottom-emptying device or equivalent will be used with the bailer to decrease aeration of the sample. For metals analysis, samples will be field filtered (with a 0.45 micron filter) from plastic caps prior to placement of samples in laboratory supplied bottles. The field filtering equipment will be rinsed with approximately 250 ml of sample ground water prior to actual sample collection.

The field filtering equipment and bottom-emptying devices will be thoroughly cleaned between each well by washing in a liquinox/-distilled water solution and then rinsing with distilled water.

The tubing for field filtering will be as discarded and replaced with new tubing for each well.

Upon completion of sampling, labelled bottles will be placed in ice chests with ice. Samples collected that day will be shipped with proper chain of custody forms using an overnight delivery service to an approved laboratory.

In addition to the ground water samples, quality control samples consisting of one trip blank, one field blank, and two replicates will also be collected during each ground water sampling event.

2.4 Surface Water Sampling

Surface water samples will be collected from two locations in the Brazos River to ensure there is no impact on the river from the site. One sample will be collected adjacent to the point of projected horizontal and vertical entry of the plume into the river, and the other to be upstream of the site. The samples will be collected in quadruplicate to provide an adequate data base to perform statistical analysis.

Surface water sampling will take place in conjunction with the ground water sampling, that is, at the same frequency and at the same time. This will result in a more efficient field operation and a data base which will allow the direct comparison of results from the ground water and the Brazos River.

The analytical methods for surface water samples will be the same as for ground water: EPA CLP protocols for volatiles, semi-volatiles, pesticides, PCBs and selected metals. These compounds are listed in Tables 2-1 and 2-2.

2.4.1 Sampling Procedures

The sampling procedures discussed below may vary from the actual procedures because of variations in water level in the river, the position and structure of the spur jetty system, or the change in position of the affected ground water relative to the river. In general, sampling will take place from a boat in the river. A Kemmerer sampler or equivalent will be used to collect a sample at an agreed-upon depth. Samples for metals analysis will be field filtered prior to placement in the sample bottles.

Upon completion of collection of the quadruplicate samples, bottles will be placed on ice in a cooler. Proper chain-of-custody procedures will be followed, and the samples shipped overnight to the laboratory for analysis.

2.5 Additional Activities

As mentioned above, water levels will be measured in all wells to be sampled prior to purging. In addition, the water level in observation wells MW-6, MW-7, MW-14, and MW-39 will be measured to better define the ground water flow direction and gradient. (Wells MW-6, MW-7, MW-14, and MW-39 will not be sampled.) Figure 2-1 shows the location of the observation wells relative to the other wells at the site.

The water level data will be used to construct water level contours maps for the shallow and deep aquifers beneath the site. The maps will then be used to determine the flow direction and calculate a ground water gradient. These data will be examined to ensure that the Brazos River remains a hydraulic barrier and a discharge point for the plume.

All data collected at the time of sampling, including purge volume calculations, water levels, pH and SC measurements, time of sample collection, sample collection procedures and the like will be recorded in field notebooks dedicated to the Sheridan site. In this way data collected in the field will be found all in one place.

3 - PRESENTATION OF DATA

Quarterly reports will be sent to the EPA to document ground water sampling activities. Additional status reports will be provided to EPA as specified in the Consent Decree. When a ground/surface water sampling event occurs, the following information will be provided to EPA in the quarterly report:

- o analytical results;
- o chain-of-custody forms;
- o ground water contour maps;
- o a discussion of analytical results in relationship to ACLs and previous results, as appropriate;
- o a graphical analysis of ground water analytical results;
- o statistical analysis of surface water analytical results; and
- o a discussion of general site conditions and maintenance of institutional controls.

If additional constituents besides the ones identified in the ACL list (Table 1-1) are detected in the ground water, ACLs will be developed for them using the methodology described in the GWMM Feasibility Study.

3.1 Graphical Analysis

The results of ground water sampling will be analyzed using graphical methods to examine the change in concentration of constituents with time. This information will be used to determine if constituent concentrations are increasing, decreasing or remaining constant through time. If the concentrations are increasing with time, a determination will be made as to approximately when (month, year) ground water trigger levels might be reached or exceeded. This information will be used to determine if the sampling frequency needs to be increased as described in Section 2. The graphical analysis will also be used to determine if the routine frequency of monitoring can resume after concentrations have stabilized at trigger levels.

3.2 Statistical Analysis

A statistical comparison of upstream versus downstream constituent concentrations will be completed for the surface water samples.

Initially, background water quality will be determined for the upgradient location by using all of the monitoring results determined for the upgradient location for all sampling events and one of the following procedures:

1. If the monitoring results show that all aliquots contain detectable concentrations of a particular parameter, then the background mean and variance for that parameter shall be established;

2. If the monitoring results show that one or more but not all of the aliquots contain no detectable concentration of a particular parameter, then the concentration of the parameter shall be determined by one of the following methods:

   (a) the concentration of the undetectable aliquot(s) shall be assumed to be equal to one-half of the mean of the reported detection limits for that parameter and the background mean shall be determined if the distribution of data is approximately log normal; or

   (b) the background parameter mean shall be adjusted for those values below the detection limit using Cohen's Method as outlined in the RCRA Ground-water Technical Enforcement Guidance Document, if the data distribution is normal.

3. If the monitoring results show that more than 90% of the aliquots contain no detectable concentrations of a particular parameter, then the background mean and the level indicating a statistically significant increase shall be equal to the Routine Analytical Services detection limit.

The determination of normality for the distribution of data (both upstream and downstream) will be made using the methods specified in Geary's procedure (Appendix A).

For the downstream location, it will be determined whether a statistically significant increase in the concentration of each parameter has occurred by comparing the ground water quality values for the downstream location to the established background surface water quality values. The following procedures will be used:

a. For each downstream monitoring parameter for which the background value was established in accordance with the procedures described in (1) and (2) above and for which Geary's procedure shows the data distribution to be

normal, the permittee shall follow Dunnett's procedure (Appendix B) to determine if the monitoring ... indicate a significant increase in the concentration of any detection monitoring parameter(s). If the monitoring location shows that one or more but not all of the aliquots contain no detectable concentrations of the parameter, then the concentration of the parameter in the undetectable aliquot(s) shall be calculated using Cohen's method;

b. For each downstream monitoring parameter for which the background value was established in accordance with the procedure described in part 3) above, the monitoring mean, calculated from all samples collected and analyzed, shall be compared to the background mean. If the concentration of the monitoring mean exceeds the concentration of the background mean, then within 90 days an additional round of analyses will be performed with four (4) aliquots of a fresh sample from the same location. If the concentration of the monitoring mean, calculated from this additional round of analyses, exceeds the concentration of the background mean, then a statistically significant increase in the concentration of that downgradient monitoring parameter has occurred; or

c. For each downgradient monitoring parameter having background values where Geary's procedure shows the data to be non-normally distributed, then the data shall be analyzed following the Mann-Whitney (Wilcoxon) non-parametric statistical method to determine if a statistically significant increase has occurred by comparing the surface water quality for the downstream location to the background surface water quality value established for each downgradient monitoring parameter.

It is anticipated that the methods outlined above will be utilized to determine if a statistically significant increase in concentration of downstream monitoring parameters is occurring in the Brazos River. However, in the event that the above methods are found to be inappropriate due to the nature of the analytical results, alternative methods, mutually agreed upon by the Sheridan Site Trust and the EPA, may be used in lieu of the procedures outlined above.

If a statistically significant increase in the concentration of any of the parameters is confirmed, the EPA will be notified within one month of settlor's receipt of the data.

4 - PREPARATION OF A REMEDIAL ACTION PLAN

A Remedial Action Plan (RAP) will be prepared for the ground water at the Sheridan site if the concentration of individual constituents reaches or exceeds the levels listed in Table 4-1. The levels in Table 4-1 are about 15% of the ACLs. The concentrations are well below the ACLs, and therefore allow a margin of safety for the environment as the plan is prepared and approved.

The use of a second, higher trigger level for preparation of a Remedial Action Plan is protective of human health and the environment as ground water sampling will be occurring every quarter, between the time the ground water trigger level is exceeded (at about 4% of the ACL) and the time the RAP trigger level (about 15% of the ACL) is reached. This quarterly sampling will ensure that the rate of change in concentration is closely monitored prior to the need for preparation of a Remedial Action Plan.

The Remedial Action Plan will be submitted to the EPA within 90 days of notification of EPA that these limits have been reached. This allows sufficient time to evaluate different alternatives for the Plan. The time frame of 90 days is protective of the environment as the average ground water flow rate is about 50 feet/year (GWMM Remedial Investigation, p. 3-39, 12/88). Because the levels in Table 4-1 are well below ACLs, protection of human health and the environment will be maintained.

The Remedial Action Plan will be implemented only if ACLs are exceeded and are confirmed by reanalysis of the well or wells in question, as specified in the ROD.

The purpose of a Remedial Action Plan is to specify the type of remedial action which will be implemented, the design and engineering specifications, and the schedule for implementation. The Plan is to be written prior to reaching ACLs, such that if ACLs are exceeded, the Plan can be put into action so that the goal of protection of human health and the environment is maintained.

TABLE 4-1

Concentration of Constituents
Needed to Trigger the Preparation
of a Remedial Action Plan

COMPOUND	CONCENTRATION (PPM)
Benzene	4
Tetrachloroethylene	6
Trans-1,2 Dichloroethylene	4
Trichloroethylene	4
Arsenic	40

5 - INSTITUTIONAL CONTROLS

Institutional controls will be implemented as part of the both the Source Control and Ground Water remedies at the Sheridan site. The controls will be administered through the use of deed recording and are designed to restrict use of the site and ground water beneath the site to protect human health and the environment. The controls will specify the following:

- ground water use on Site will be prohibited after the remedial action is complete.
- the use of any well, other than for remedial action purposes, which could potentially affect the size or shape of the plume of affected ground water will be prohibited.

APPENDIX A

Geary's Procedures

Geary's Test for Normality

This test requires only standard calculations from the data.

Initial Calculations

Label the n data values: $X_1, X_2, \ldots\ldots X_n$,

and calculate the sample mean($\bar{X}$);

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

Then calculate the sample sum-of-squares (SSS):

$$SSS = \sum_{i=1}^{n} X_i^2 - \frac{\left(\sum_{i=1}^{n} X_i\right)^2}{n}$$

Finally calculate the sum of absolute deviations (SAD);

$$SAD = \sum_{i=1}^{n} \left| X_i - \bar{X} \right|$$

The Test

Geary's test statistic, a, is:

$$a = \frac{SAD}{\sqrt{n\,(SSS)}}$$

and values of "a" that are "too large" or "too small" indicate possible non-normality.

Testing "a" for Significance

An approximate test for significance may be computed using the formula,

$$z = \frac{(a - 0.7979)}{\left(\frac{0.2123}{\sqrt{n}}\right)}$$

This Z is approximately a standard normal distribution and may be compared to tabulated values. For the "usual" levels of significance, 10%, 5%, 1%, the determination of non-normality may be expressed by the following decision rule:

Declare "a" as being significantly small/large (and so non-normality has been detected in the data set) if:

Z (sign ignored) is larger than 1.645 (10% level of significance),

Z (sign ignored) is larger than 1.96 (5% level of significance),

Z (sign ignored) is larger than 2.575 (1% level of significance).

Example

To illustrate the methodology, suppose 10 data points have been submitted for review, ranging from a low of 10 ppm to a high of 17 ppm. The actual order in which the data were obtained from the chemist (i.e., the order in which the individual samples were analyzed) is not of importance and so the data may be listed from smallest to largest without affecting the validity of the statistical test. The data:

10 ppm, 11 ppm, 11 ppm, 12 ppm, 12 ppm,, 12 ppm, 12 ppm
13 ppm, 13 ppm, 17 ppm

Initial Calculations

$$\text{Sample mean } \bar{X} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{\sum_{i=1}^{10} x_i}{10} = \frac{123}{10} = 12.3 \text{ ppm}$$

$$\text{Sample Sum of Squares (SSS)} = \sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}$$

$$= \sum_{i=1}^{10} x_i^2 - \frac{\left(\sum_{i=1}^{10} x_i\right)^2}{10}$$

$$= (10^2 + 11^2 + 11^2 + 12^2 + 12^2 + 12^2 + 12^2 + 13^2 + 13^2 + 17^2) - \frac{(123)^2}{10}$$

$$= 1545 - 1512.9$$

i.e.,

$$\underline{SSS = 32.1}$$

$$\underline{\text{Sum of Absolute Deviations}}\ (SAD) = \sum_{i=1}^{n} \left| x_i - \bar{x} \right|$$

Where the notation $\left| x_i - \bar{x} \right|$ indicates that the sample mean ($\bar{x}$) must be subtracted from each data value and if there is a negative sign, that sign must be replaced by a positive sign.

In this particular case,

$$SAD = \sum_{i=1}^{10} \left| x_i - \bar{x} \right|$$

$$= \left|10-12.3\right| + \left|11-12.3\right| + \left|11-12.3\right| \left|11-12.3\right| + \left|12-12.3\right| + \left|12-12.3\right|$$

$$+ \left|12-12.3\right| + \left|13-12.3\right| + \left|13-12.3\right| + \left|17-12.3\right|$$

i.e,

$$SAD = \left|-2.3\right| + \left|-1.3\right| + \left|-1.3\right| + \left|-0.3\right| + \left|-0.3\right| + \left|-0.3\right| + \left|-0.3\right| + \left|0.7\right|$$

$$\left| + \left|0.7\right| + \left|0.7\right| + \left|0.7\right| + \left|4.7\right| \right.$$

$$= 2.3 + 1.3 + 1.3 + 0.3 + 0.3 + 0.3 + 0.3 + 0.7 + 0.7 + 4.7$$

i.e., $\underline{SAD = 11.0}$

The Test

$$\text{Geary's } a = \frac{SAD}{\sqrt{n(SSS)}}$$

$$= \frac{11.0}{\sqrt{10 \times 32.1}}$$

$$= \frac{11.0}{\sqrt{321}}$$

i.e., $a = 0.6139$.

Testing "a" for Significance

This test will determine whether or not a (= 0.6139) is too small to have occurred by chance if, as we presume, the data is really normally distributed. If "a" is determined to be too small (e.g, using the 5% level of significance) then the conclusion is that the data set is most likely not normal. If, on the other hand, "a" is determined not be be too small then the conclusion will be that the data set is probably normaliy distributed.

$$z = \frac{(a - 0.7979)}{\left(\frac{0.2123}{\sqrt{n}}\right)}$$

$$= \frac{0.6139 - 0.7979}{\left(\frac{0.2123}{\sqrt{10}}\right)}$$

i.e.,

$$z = -2.74$$

From the list of decision rules, the appropriate rule for 5% level of significance reads "Declare 'a' as being significantly small/large (in this case small) if Z (sign ignored) is larger than 1.96 (5% level of significance)." Clearly the Z calculated is larger than 1.96 (when the sign is ignored) and so the conclusion is that the data set is most probably non-normally distributed.

Note

This is an example to demonstrate Geary's test procedure and is artificial in that no below detection limit data was included. Testing for normality when large quantities of data are below detection limits is a little more complicated and should be handled separately.

It can be shown that the mean value of "a" when normality holds is 0.7979 and therefore values of "a" very much less than this should be regarded as small, those very much larger than 0.7979 as being large. With this specific example, it is worth noting that the largest value (17 ppm) is an outlier and should possibly be regarded as not being part of the remaining data (it is correctly identified as an outlier by Dixon's test). With the largest value discarded, the data could be regarded as being from a normal distribution.

APPENDIX B

Dunnett's Procedures

NOTE:

The following appendix contains references to upgradient and downgradient wells and ground water. As applied to the Sheridan site, however, these references relate to upstream and downstream locations of surface water samples.

DESCRIPTION OF STATISTICAL PROCEDURES FOR DETECTION OF GROUND-WATER CONTAMINATION AT HAZARDOUS WASTE LAND DISPOSAL FACILITIES

Introduction

This memo describes three statistical procedures for detecting ground-water contamination that are presently under consideration. Dunnett's procedure simultaneously compares each downgradient well with a control (upgradient). Steel's procedure is a nonparametric version of Dunnett's using a rank sum statistic in place of a t-statistic. If data are extremely nonnormally distributed, they may either be transformed to approximate normality and analyzed by Dunnett's, or analyzed in their original form by Steels' procedure. To apply Steel's test, however, may require additional sampling since it may be much less powerful with a small number of samples per well. Both of these procedures may also be used to test for overall contamination across downgradient wells.

Individual well contamination may also be detected by use of control charts. These charts compare current samples with historical data from the same well. The use of all three procedures is currently under consideration for detecting ground-water contamination at hazardous waste land disposal facilities.

Dunnett's Procedure

Dunnett's procedure is a parametric test that simultaneously compares the sample mean for each of p treatment groups to the sample mean for a control group. Each treatment group mean that differs from the control group mean by a given threshold, or "allowance," is declared to be significantly different from the control group mean. The experimentwise level of significance is maintained at a prescribed value, α.

In the present context, the control group is the upgradient well and the treatment groups are p downgradient wells. The Null Hypothesis under test is that the population means of the downgradient wells ($\mu_i, i=1 \le i \le p$) are all equal to the population mean for the upgradient well (μ_0):

$$H_0: \mu_i = \mu_0 \qquad \text{for every } i,\ 1 \le i \le p .$$

The Alternative Hypothesis is that the population mean for at least one of the downgradient wells is greater than that of the upgradient well:

H_A: $\mu_i > \mu_0$, for at least one i, $1 \le i \le p$.

The assumptions required for Dunnett's procedure to be valid are that the (p+1) samples are independent, and that each is a random sample from a normal distribution with a common variance.

The test statistic for each downgradient well is the familiar t-statistic

$$T_i = \frac{\bar{X}_i - \bar{X}_0}{S_p\sqrt{2/n}}, \qquad 1 \le i \le p,$$

where $\bar{X}_i$ is the sample mean for the i-th downgradient well, $\bar{X}_0$ is the sample mean for the single upgradient well, S_p is the pooled estimate of the standard deviation from all p+1 wells, and n is the sample size which is the same for all (p+1) wells.

Critical points for α=.01 and α=.05 were tabled by Dunnett (1955) and are included in the appendix. The degrees of freedom (d.f.) required to enter the table is equal to the sum of the sample sizes for all wells minus (p+1). Here, d.f. = (p+1)(n-1), since the sample size is the same for each well. If d (which depends on d.f., p and α) is the appropriate critical point, we reject H_0 if, for any downgradient well, $T_i \ge d$ or equivalently if

$$(\bar{X}_i - \bar{X}_0) \ge S_p\sqrt{2/n}\ d$$

for at least one i, $1 \le i \le p$. The right-hand side of the above equation, $(S_p\sqrt{2/n}\ d)$, is referred to as the allowance. If the difference between the sample mean for the i-th downgradient well and the upgradient well exceeds the "allowance," we reject H_0 and conclude that $\mu_i > \mu_0$.

Example

The following table gives raw data (4 independent readings from each of 5 wells) and summary statistics for TOX in parts per billion.

	Well Number				
	0	1	2	3	4
	64.8	68.4	66.3	64.7	64.2
	64.2	69.7	66.2	65.3	64.5
	65.0	68.6	65.7	65.0	64.3
	64.7	67.7	66.8	65.1	64.3
Σx	258.7	274.4	265.0	260.1	257.3
$\bar{x}_i$	64.675	68.600	66.250	65.025	64.325
$\bar{x}_i - \bar{x}_0$	NA	3.925	1.575	.350	-.350
Σx^2	16,731.77	18,825.90	17,556.86	16,913.19	16,550.87
S_i^2	.11583	.68667	.20333	.06250	.01583
T_i	NA	11.92	4.78	1.06	-1.06

For each well, the sample variance S_i^2 is equal to $(\Sigma x^2 - n\bar{x}_i^2)/(n-1)$. Since the sample sizes are all equal, the pooled estimate of the variance is simply the average of the individual estimates of the variance: $S_p^2 = (.11583 + .68667 + .20333 + .06250 + .01583)/5 =$ .21683 , which yields $S_p = .46565$ and $S_p\sqrt{2/n} = .32927$.

In this example p=4, n=4, and d.f. = (p+1)(n-1) = 15. From Table 1a* of the appendix the .05 level critical point is 2.36. We see that $T_i \geq 2.36$ for well numbers 1 and 2. Thus, we conclude that the levels of TOX observed in wells 1 and 2 are significantly higher than the level observed in the upgradient well. Equivalently, we can calculate the "tolerance" $S_p\sqrt{2/n}\ d = (.32927)(2.36) = .777$ and compare each difference $(\bar{x} - \bar{x}_0)$ to this tolerance.

Occasionally, sample sizes will not be equal across all wells. This may occur accidentally or by design. For a given sample size, the optimal allocation of measurements calls for somewhat heavier sampling of the upgradient well. For example, 6 measurements for the upgradient well and 4 measurements from each of 4 downgradient wells is optimal among designs with a total of 22 measurements.

When analyzing data with unequal sample sizes, the procedure is similar. The test statistic is formulated as

$$T_i = \frac{\bar{x}_i - \bar{x}_0}{S_p\sqrt{\frac{1}{n_0} + \frac{1}{n_i}}}, \qquad i=1\le i\le p,$$

where n_0 and n_i are the sample sizes for the upgradient and i-th downgradient wells, respectively. The degrees of freedom is given by $d.f.=\Sigma(n_i-1)=(\Sigma n_i-p-1)$ and S_p^2 can be calculated as $S_p^2 = \Sigma(n_i-1)s_i^2/d.f.$ The critical point obtained from Table 1a* will provide an approximate .05 α-level test. (Dunnett [1964] gives a method for adjusting critical points for unequal sample sizes when making two-sided comparisons.)

The test procedure can be easily modified to allow for inherent well differences by testing the Null Hypothesis

$$H_0: \mu_i = \mu_0 + \Delta_i, \qquad \text{for every } i,\ 1\le i\le p,$$

versus

$$H_A: \mu_i > \mu_0 + \Delta_i, \qquad \text{for at least one } i,\ 1\le i\le p,$$

increasing the i-th "allowance" by Δ_i or equivalently formulating the test statistic as

$$T_i = \frac{\bar{x}_i - \bar{x}_0 - \Delta_i}{S_p\sqrt{2/n}}$$

Two-sided tests may also be required for some constituents, such as pH. In this case, we reject the Null Hypothesis for unusually small values of T_i as well as large values. Critical points for two-sided tests can also be found in Dunnett (1955).

It may be desirable to compare the average downgradient well to the upgradient well. This can be done by formulating t-statistic as

$$T_i = \frac{\frac{\bar{x}_1 + \bar{x}_2 + \bar{x}_3 + \bar{x}_4}{4} - \bar{x}_0}{S_p\sqrt{1.25/n}}.$$

In fact, any contrast of the μ_i, say $\sum w_i\mu_i$, can be tested using the statistic $\sum w_i\bar{x}_i/(S_p\sqrt{\sum w_i^2/n_i})$.

Steel's Procedure

Steel's procedure is a nonparametric rank test that simultaneously compares each of p treatment groups to the single control group for shifts in location. Each treatment group for which the rank sum exceeds the critical value is declared to have a greater mean (or median or other location value) than does the control group. The experimentwise level of significance is maintained at a prescribed value, α.

In the present context, the control group is the upgradient well and the treatment groups are p downgradient wells. Suppose f(x) is the density function of the upgradient well. A distribution that differs from f(x) by a shift in location will have density $f(x-\theta)$ for some $\theta \neq 0$. Steel's procedure tests the Null Hypothesis that the downgradient wells all have the same distribution as the upgradient well;

$$H_0: \theta = 0, \quad \text{for every } i,\ 1 \leq i \leq p.$$

The Alternative Hypothesis is that at least one of the downgradient wells has a location parameter greater than 0;

$$H_A: \theta > 0, \quad \text{for at least one } i,\ 1 \leq i \leq p.$$

The assumptions required for Steel's procedure to be valid are that the (p-1) samples are independent, and that each is a random sample from the same continuous distribution, except for possible differences in location.

The test statistic for each downgradient well is the familiar Wilcoxon Rank Sum statistic. Computation of the statistic for the i-th downgradient well requires three steps:

(1) Pool the data for the i-th treatment group with the data for the control group;

(2) Rank the pooled data from smallest to largest; and

(3) Compute the sum of the ranks, R_i, assigned to the treatment group.

Critical points for $\alpha=.01$ and $\alpha=.05$ are given in Miller (1966) and Steel (1959). (The table in Steel (1959) gives critical points for $R_i' = (2n+1)n-R_i$.) Use of these tables requires that the sample sizes for each well be equal to n. The tables from Miller (1966) are reproduced in the appendix. If d (which depends on n, p and α) is the appropriate critical point, we reject H_0 if $R_i \geq d$, for at least one i, $1 \leq i \leq p$, where R_i is the Wilcoxon Rank Sum statistic.

If ties are encountered, first attempt to break ties by referring to the raw data to see if the values were recorded to more decimal places. Assign midranks to any remaining ties. Alternatively, we can assign ranks conservatively (anti-conservatively) to obtain a conservative (anti-conservative) test. This technique will be illustrated in the example below.

Example

The following table gives raw data (4 independent readings from 5 wells) for TOX in parts per billion. The numbers in parenthesis are the ranks. (For upgradient well 0, the first number in parenthesis is the rank for the comparison with well 1, the second number is the rank for the comparison with well 2, etc.)

	Well Number				
	0	1	2	3	4
	64.8(3,3,4,7)	68.4(6)	66.3(7)	64.7(2.5)	64.2(1.5)
	64.2(1.5,1,1.5)	69.7(8)	66.2(6)	65.3(8)	64.5(5)
	65.0(4,4,5.5,8)	68.6(7)	65.7(5)	65.0(5.5)	64.3(3)
	64.7(2.2,2.5,6)	67.7(5)	66.8(8)	65.1(7)	64.3(4)
Sum of Ranks R_i:		26	26	23	13.5

Referring to Steel (1959) we can compute the .05 level critical point for n=4 and p=4 to be 26. We see that $R_i \geq 26$ for i=1 and 2. Thus we conclude that the levels of TOX in downgradient wells 1 and 2 are greater than the level in the upgradient well.

Note that ties resulted when analyzing the results from wells 3 and 4. Even with anticonservative rank assignments (i.e., 3, 6, 7 and 8 for well 3 and 2, 3, 4, and 5 for well 4) the critical value of 26 would not have been reached. Thus, there is insufficient evidence to conclude that TOX levels in either well 3 or 4 are greater than the TOX level in the upgradient well.

In order to achieve the critical point of 26 in this particular example, all the values for the downgradient well being compared must exceed all the values for the upgradient well, i.e., there must be no overlap. This example points out the relative insensitivity of the Wilcoxon statistic to mean differences in certain circumstances. With larger sample sizes, lack of overlap is not required for the null hypothesis to be rejected. Still, if the underlying distribution is normal, Steel's procedure is not as powerful as Dunnett's. On the other hand, with certain non-normal data, Steel's procedure can be more powerful than Dunnett's.

Variations on Steel's Procedure

Suppose the sample sizes are the same for the downgradient wells, but we have a different sample size for the upgradient well. In this case the computational procedure is the same, but special critical points must be used. (See Miller (1966, p151)). A larger sample size for the upgradient well can provide a more efficient test.

The procedure can be easily modified to allow for inherent well differences by testing the Null Hypothesis

$$H_o: \theta_i = \Delta_i, \qquad \text{for every } i,\ 1 \le i \le p,$$

versus

$$H_A: \theta_i > \Delta_i, \qquad \text{for at least one } i,\ 1 \le i \le p.$$

This is accomplished by first subtracting Δ_i from each sample value for the i-th well, and then proceeding as before.

Two-sided tests may also be required for some constituents, such as pH. In this case, we reject the Null Hypothesis for large values of R_i, or large values of its complement $R_i' = (2n+1)n - R_i$. Critical points for two-sided tests can be found in Miller (1966) and Steel (1959).

It may be desirable to compare the average downgradient well to the upgradient well. This can be done by first pooling the data for all downgradient wells. We now make only one comparison using the standard Wilcoxon two-sample test. If all downgradient wells are contaminated to about the same degree, this test is more powerful than Steel's procedure applied to multiple downgradient wells.

Control Charts

Control charts can be used to monitor contaminant levels over time to detect differences from historical readings. Average readings for each month are plotted along with a measure of their variability; if particular readings differ from historical averages by a significant level then a change from past levels is indicated. Slight changes in average constituent levels along with steadily increasing contamination can also be detected.

The Null Hypothesis under test is that the average level (μ_{it}) of constituent at a particular well has remainded steady since baseline sampling.

$$H_o: \mu_{it} = \mu_{io} \quad \text{for each well } i, \text{ for all time } t \ge 1.$$

The Alternative Hypothesis is that the constituent level has increased.

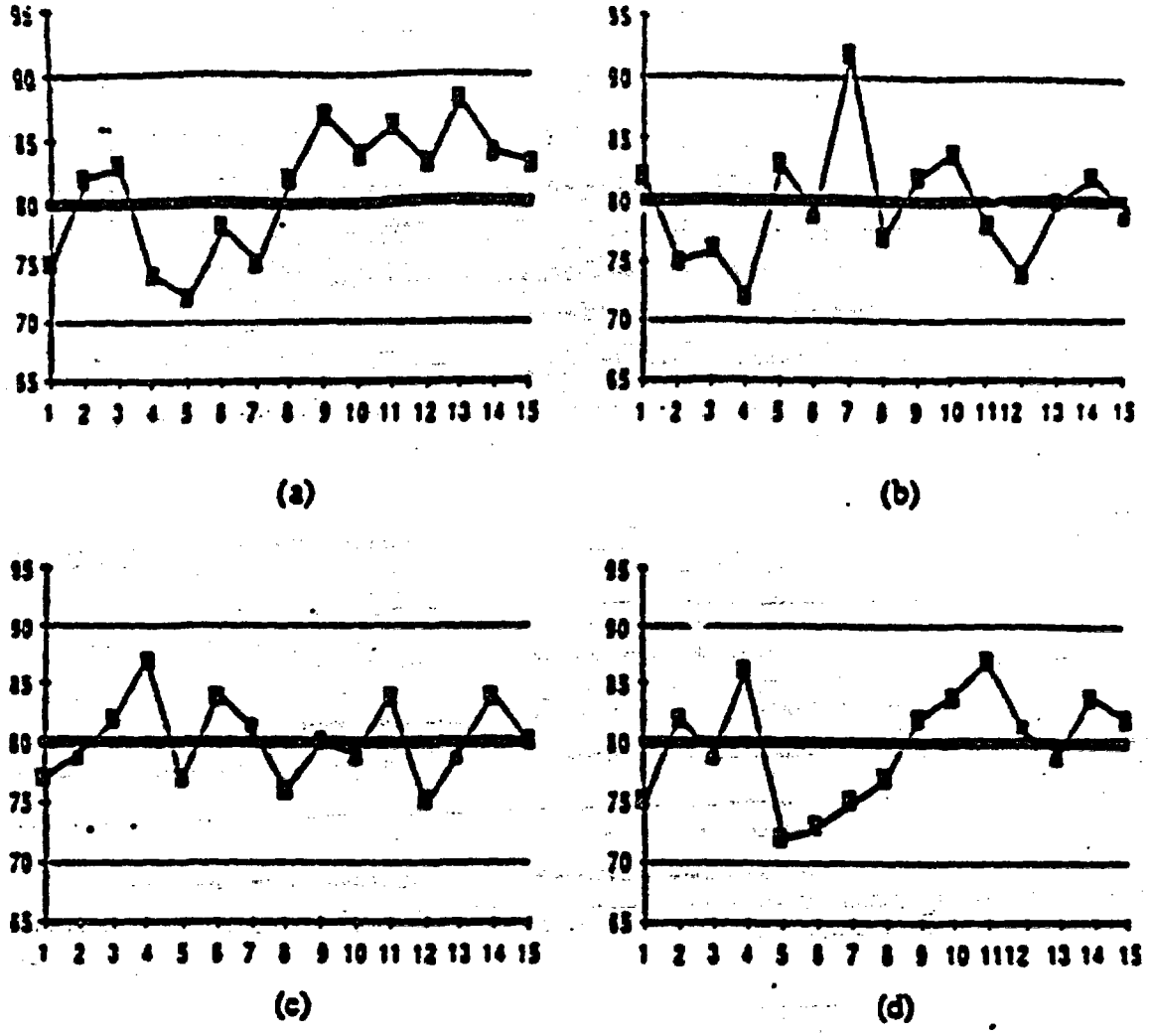
$$H_A: \mu_{it} > \mu_{i0} \quad \text{for some well } i, \text{ at some time } t \geq 1.$$

There are two assumptions required for control charts. The samples which are averaged to plot as a value on the chart must be sufficient in number for the averages to be approximately normally distributed, and each set of samples must be independent of each other.

The test procedure is to set bounds (control limits) based upon the average of the monthly plotted averages and the average monthly variability beyond which it would be extremely unlikely for an average value to fall if the null hypothesis is true. Increases in the constituent level will cause values to exceed these control limits and the null hypothesis to be rejected. In addition to being rejected because of a radical departure from past levels, the null hypothesis will also be rejected if eight successive average values are above the historical average or if six successive averages are monotonically increasing. These latter two checks will detect a small but consistent increase in contamination and continually increasing levels of contamination, respectively. While a constant level of variability is not being tested in the hypothesis, it is still necessary to chart it monthly. If the variability exceeds its control limits or exhibits runs or trends, it will indicate a need to revise the limits for average constituent level. This is the only reason for recomputing these limits.

Example

The following four graphs of TOX in parts per billion at a particular well demonstrate these rules. In all cases, the historical average level has been 80 ppb. In graph a, a persistant change to levels of approximately 85 ppb has been indicated by eight successive readings above the historical average. In graph b, a one-time level of 92 ppb in quarter 7 exceeds the upper control limit of 90 indicating contamination. Graph c shows a stable level of constituent in the ground water. Graph d shows a trend of 7 (6 would have been sufficient) successive quarterly readings that increase. This pattern of ground-water contamination is again reason to reject the null hypothesis. Only graph c would not indicate increased contamination.



Construction of Control Limits

To construct the control limits, it is first necessary to compute the average, $\bar{x}$, and range, R, of each set of sample readings. The historical averages are then found by averaging these numbers over the baseline period. These historical averages are called $\bar{\bar{x}}$ and $\bar{R}$. If UCL and LCL stand for upper and lower control limits, respectively, then the formulas for constructing the control limits for the ranges are:

$$UCL_R = D_4\bar{R} \quad \text{and} \quad LCL_R = D_3\bar{R}$$

and for the averages

$UCL_{\bar{x}} = \bar{\bar{x}} + A_2\bar{R}$ and $LCL_{\bar{x}} = \bar{\bar{x}} - A_2\bar{R}$.

The following table gives the values of D_4, D_3, and A_2 for different numbers of samples (n) used to compute each $\bar{x}$ and R. More extensive tables are available in Grant and Leavenworth (1980).

n	2	3	4	5	6	7	8
D_4	3.27	2.57	2.28	2.11	2.00	1.92	1.86
D_3	0	0	0	0	0	0.08	0.14
A_2	1.88	1.02	0.73	0.58	0.48	0.42	0.37

Variations on Control Charts

At least four variations on control charts may be appropriate: adjustments for seasonality, testing for improvement, using individual readings, and simultaneously testing multiple constituents.

Many hazardous waste facilities have significant seasonal variability in constituent levels. This background seasonality may be adjusted for by computing separate monthly (or quarterly) averages during the two-year baseline period. Future values would then be adjusted for these monthly (quarterly) seasonal differences before being plotted on the control chart.

The same control chart that is constructed to detect contamination can also detect improvements over past levels. This is indicated by averages below the lower control limit, runs below the historical average, or downward trends. This use of control charts may be helpful for corrective action and detection monitoring. If a site has improved, they could be judged against this revised standard rather than the initial levels.

If in each time period only one reading is collected, it is impossible to plot average values. This requires two modifications to the above procedure. Without averaging, it becomes necessary for the individual readings to be normally distributed. If this is not the case, the data must be transformed to an approximately normal distribution before plotting or limits computed based on the alternative distribution. Ranges within time periods can also no longer be computed. These are replaced by ranges between successive pairs (or triples, etc.) of time periods. The value of n for determining the table constants is now 2 (or 3, etc.). The constant A_2 is also replaced by E_2 given in the following table:

n	2	3	4	5	6	7	8
E_2	2.66	1.77	1.46	1.29	1.18	1.11	1.05

Due to the large number of constituent/well combinations it may be advantageous to collapse multiple constituents or wells together on one chart. The resulting control chart uses a χ^2 distribution instead of a normal distribution and has only an upper control limit. The disadvantage is that if the chart indicates contamination, it is not necessarily obvious which particular constituent or well is contaminated. See Alt (1985) for further details.

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Table 1a. Dunnett's Procedure: Table of t for one-sided comparisons between p treatment means and a control for a joint confidence coefficient of P = 95%

d.f.	p, Number of Treatment Means (Excluding The Control): 1	2	3	4	5	6	7	8	9
5	2.02	2.44	2.68	2.85	2.98	3.08	3.16	3.24	3.30
6	1.94	2.34	2.56	2.71	2.83	2.92	3.00	3.07	3.12
7	1.89	2.27	2.48	2.62	2.73	2.82	2.89	2.95	3.01
8	1.86	2.22	2.42	2.55	2.66	2.74	2.81	2.87	2.92
9	1.83	2.18	2.37	2.50	2.60	2.68	2.75	2.81	2.86
10	1.81	2.15	2.34	2.47	2.56	2.64	2.70	2.76	2.81
11	1.80	2.13	2.31	2.44	2.53	2.60	2.67	2.72	2.77
12	1.78	2.11	2.29	2.41	2.50	2.58	2.64	2.69	2.74
13	1.77	2.09	2.27	2.39	2.48	2.55	2.61	2.66	2.71
14	1.76	2.08	2.25	2.37	2.46	2.53	2.59	2.64	2.69
15	1.75	2.07	2.24	2.36	2.44	2.51	2.57	2.62	2.67
16	1.75	2.06	2.23	2.34	2.43	2.50	2.56	2.61	2.65
17	1.74	2.05	2.22	2.33	2.42	2.49	2.54	2.59	2.64
18	1.73	2.04	2.21	2.32	2.41	2.48	2.53	2.58	2.62
19	1.73	2.03	2.20	2.31	2.40	2.47	2.52	2.57	2.61
20	1.72	2.03	2.19	2.30	2.39	2.46	2.51	2.56	2.60
24	1.71	2.01	2.17	2.28	2.36	2.43	2.48	2.53	2.57
30	1.70	1.99	2.15	2.25	2.33	2.40	2.45	2.50	2.54
40	1.68	1.97	2.13	2.23	2.31	2.37	2.42	2.47	2.51
60	1.67	1.95	2.10	2.21	2.28	2.35	2.39	2.44	2.48
120	1.66	1.93	2.08	2.18	2.26	2.32	2.37	2.41	2.45
inf.	1.64	1.92	2.06	2.16	2.23	2.29	2.34	2.38	2.42

* Table [illegible]

Table 1b. Dunnett's Procedure: Table of t for one-sided comparisons between p treatment means and a control for a joint confidence coefficient of P = 99%

	p, Number of Treatment Means (Excluding the Control)								
d.f.	1	2	3	4	5	6	7	8	9
5	3.37	3.90	4.21	4.43	4.60	4.73	4.85	4.94	5.03
6	3.14	3.61	3.88	4.07	4.21	4.33	4.43	4.51	4.59
7	3.00	3.42	3.66	3.83	3.96	4.07	4.15	4.23	4.30
8	2.90	3.29	3.51	3.67	3.79	3.88	3.96	4.03	4.09
9	2.82	3.19	3.40	3.55	3.66	3.75	3.82	3.89	3.94
10	2.76	3.11	3.31	3.45	3.56	3.64	3.71	3.78	3.83
11	2.72	3.06	3.25	3.38	3.48	3.56	3.63	3.69	3.74
12	2.68	3.01	3.19	3.32	3.42	3.50	3.56	3.62	3.67
13	2.65	2.97	3.15	3.27	3.37	3.44	3.51	3.56	3.61
14	2.62	2.94	3.11	3.23	3.32	3.40	3.46	3.51	3.56
15	2.60	2.91	3.08	3.20	3.29	3.36	3.42	3.47	3.52
16	2.58	2.88	3.05	3.17	3.26	3.33	3.39	3.44	3.48
17	2.57	2.86	3.03	3.14	3.23	3.30	3.36	3.41	3.45
18	2.55	2.84	3.01	3.12	3.21	3.27	3.33	3.38	3.42
19	2.54	2.83	2.99	3.10	3.18	3.25	3.31	3.36	3.40
20	2.53	2.81	2.97	3.08	3.17	3.23	3.29	3.34	3.38
24	2.49	2.77	2.92	3.03	3.11	3.17	3.22	3.27	3.31
30	2.46	2.72	2.87	2.97	3.05	3.11	3.16	3.21	3.24
40	2.42	2.68	2.82	2.92	2.99	3.05	3.10	3.14	3.18
60	2.39	2.64	2.78	2.87	2.94	3.00	3.04	3.08	3.12
120	2.36	2.60	2.73	2.82	2.89	2.94	2.99	3.03	3.06
inf.	2.33	2.56	2.68	2.77	2.84	2.89	2.93	2.97	3.00

* Table 1b [illegible]

Table 2. Percentage points for Steel's procedure (k downgradient wells, n samples from each well)

(One-tailed)

	α = .05									α = .01								
n \ k	2	3	4	5	6	7	8	9	10	2	3	4	5	6	7	8	9	10
5	-	-	-	-	-	-	-	-	-									
6	6	-	-	-	-	-	-	-	-									
7	7	7	7	-	-	-	-	-	-									
8	8	8	8	8	8	8	8	-	-									
9	9	9	9	9	9	9	9	9	9	9	-	-	-	-	-	-	-	-
10	9	9	9	10	10	10	10	10	10	10	10	10	-	-	-	-	-	-
11	10	10	10	10	10	10	11	11	11	11	11	11	11	11	11	-	-	-
12	10	11	11	11	11	11	11	11	11	11	12	12	12	12	12	12	12	12
13	11	11	11	12	12	12	12	12	12	12	12	13	13	13	13	13	13	13
14	12	12	12	13	13	13	13	13	13	13	13	13	13	13	14	14	14	14
15	12	13	13	13	13	13	13	13	13	13	14	14	14	14	14	14	14	14
16	13	13	13	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15
17	13	14	14	14	14	14	15	15	15	15	15	15	15	16	16	16	16	16
18	14	14	15	15	15	15	15	15	15	15	16	16	16	16	16	16	16	17
19	15	15	15	15	16	16	16	16	16	16	16	17	17	17	17	17	17	17
20	15	16	16	16	16	16	16	17	17	17	17	17	17	18	18	18	18	18
21	16	16	16	16	16	16	18	18	18	18	18	18	18	18	19	19	19	19
22	17	17	17	17	17	17	17	18	18	18	18	19	19	19	19	19	19	20
23	17	17	18	18	18	18	18	18	18	18	19	19	19	19	20	20	20	20
24	18	18	18	18	18	19	19	19	19	19	19	20	20	20	20	20	20	21
25	18	19	19	19	19	19	19	19	20	20	20	20	20	21	21	21	21	21
26	19	19	19	20	20	20	20	20	20	20	20	21	21	21	21	21	22	22
27	20	20	20	20	20	20	21	21	21	21	21	21	22	22	22	22	22	22
28	20	21	21	21	21	21	21	21	21	21	22	22	22	22	22	23	23	23
29	21	21	21	22	22	22	22	22	22	22	22	23	23	23	23	23	23	24
30	22	22	22	22	22	22	23	23	23	23	23	23	24	24	24	24	24	24
40	27	28	28	28	28	29	29	29	29	29	30	30	30	30	31	31	31	31
50	33	34	34	35	35	35	35	36	36	36	36	37	37	37	38	38	38	38
100	65	65	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66

Table 2. Percentage points for Steel's procedure (continued)
(k downgradient wells, n samples from each well)

	(Two-tailed)															
	α=.05								α=.01							
n \ k	2	3	4	5	6	7	8	9	2	3	4	5	6	7	8	9
6	-	-	-	-	-	-	-	-								
7	7	-	-	-	-	-	-	-								
8	8	8	8	-	-	-	-	-								
9	9	9	9	9	9	-	-	-	-	-	-	-	-	-	-	-
10	9	10	10	10	10	10	10	10	10	-	-	-	-	-	-	-
11	10	10	11	11	11	11	11	11	11	11	11	-	-	-	-	-
12	11	11	11	11	12	12	12	12	12	12	12	12	12	-	-	-
13	11	12	12	12	12	12	13	13	13	13	13	13	13	13	13	13
14	12	13	13	13	13	13	13	13	13	13	14	14	14	14	14	14
15	13	13	13	13	14	14	14	14	14	14	14	14	15	15	15	15
16	13	14	14	14	14	14	14	14	15	15	15	15	15	15	15	15
17	14	14	15	15	15	15	15	15	15	15	16	16	16	16	16	16
18	15	15	15	15	16	16	16	16	16	16	16	17	17	17	17	17
19	15	16	16	16	16	16	16	16	17	17	17	17	17	17	18	18
20	16	16	17	17	17	17	17	17	17	18	18	18	18	18	18	18

Appendix C

GROUP "A" SETTLORS
FOR [illegible] GROUND WATER CONSENT DECREE
03/26/89

Baker Hughes
Baroid (for NL Industries)
Betz Laboratories, Inc.
Champion International Corp.
Chemical Exchange (CXI)
Dixie Chemical Co.
Dresser Industries, Inc.
DSI Transports, Inc.
E.I. duPont
Enterprise (for Cango Corp.,
Ethyl Corporation
Exxon Chemical Co.
Galveston-Houston
GATX, Fuller Co.
Goodyear
Hoechst Celanese Corporation
Jetco Chemicals
Johnston
Lubrizol
Merichem Company
O'Brien Corp. (for Napko)
Oteco Equipment Co.
Paktank
Pearsall Chemical, Witco
Petrolite Corp.
PPG Industries
Rocno Inc. (formerly Oncor)
Rohm and Haas
Tenneco Polymers, Inc. (including Petro-Tex Chemical Corporation for this purpose)
TRW Mission Drilling
Tubular Finishing Works
Vetco Gray (for Gray Tool Co.)

GROUP "B" SETTLORS
FOR SHERIDAN SITE GROUND WATER CONSENT DECREE
03/26/89

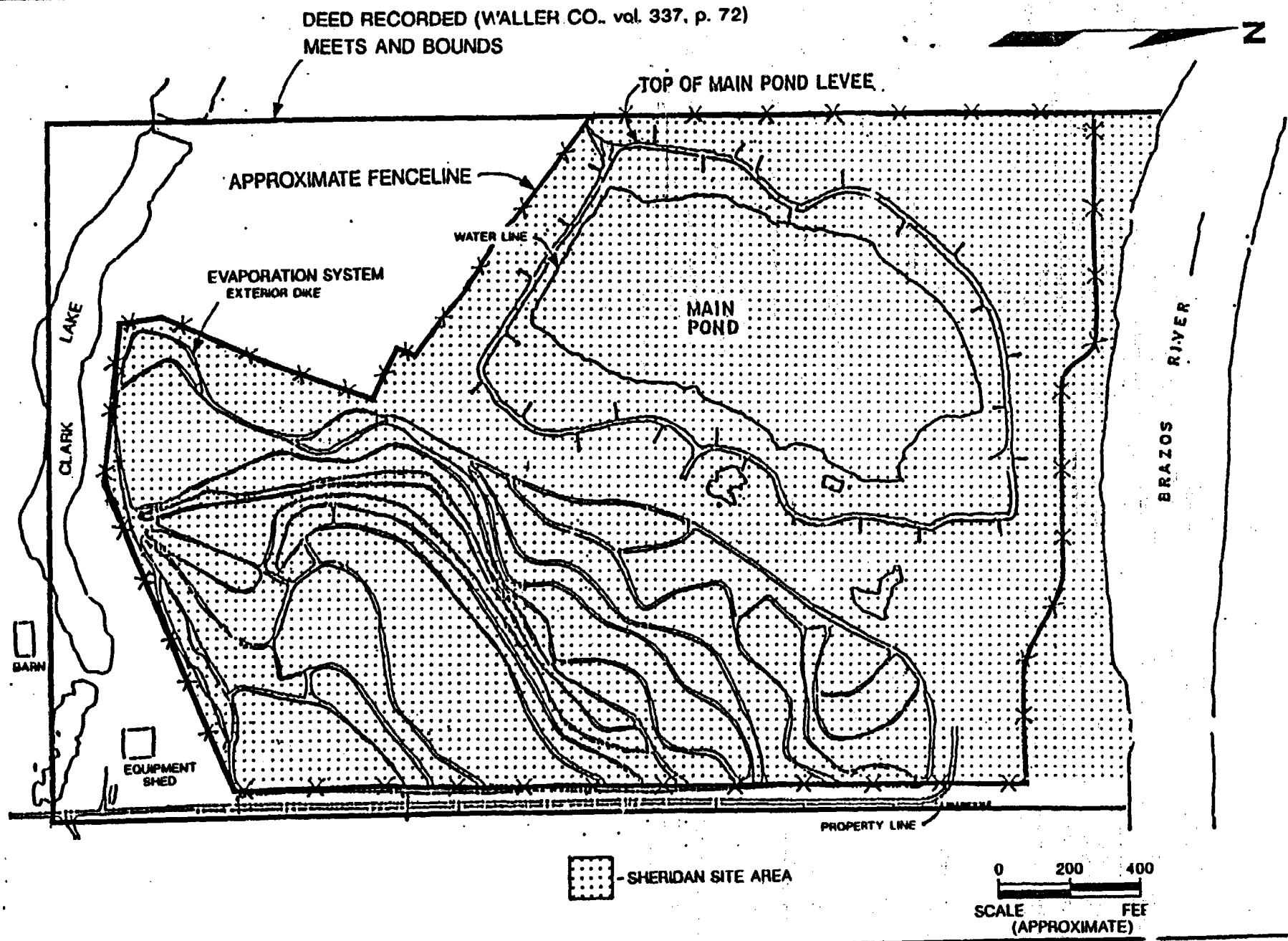
	Amount Paid*	Amount Due
Armco, Inc.	185,790	0
Austin American-Statesman	15,000	0
Aztec Manufacturing Co.	20,000	0
Battelle Memorial Institute	15,000	0
Berwind Railway Service Company	30,000	0
Best Industries, Inc. for Varco/Best Flow Products (for Best Industries)	78,224	0
Borden, Inc.	15,000	0
Boring Specialties, Inc.	15,000	0
Briner Paint Mfg. Co., Inc.	20,000	0
Brown & Root, Inc.	53,200	0
Browning-Ferris Industries Chemical Services, Inc.	680,840	0
C & H Transportation Co., Inc.	15,000	0
Cameron Forge Company (successor to Cameron Iron Works, Inc.)	20,000	0
The Celotex Corporation (successor to Philip Carey Manufacturing Company)	15,000	0
Chemical Leaman Tank Lines, Inc.	15,000	0
Crown Central Petroleum Corporation	37,639	0
Dailey Petroleum Services Corp. (successor to Dailey Oil Tools, Inc.)	15,000	0
The Dow Chemical Company	30,000	0
Eltex Chemical Supply	3,997	0
FMC Corporation	55,704	0
French Ltd. Inc., French Ltd. of Houston Inc., George Whitten and Luther P. Hendon	100,000	0
Gammaloy, Ltd.	15,000	0
General Welding Works, Inc.	98,420	0
Gulf Forge Company	15,000	0
Hercules Incorporated	15,000	0
Homco Int'l Inc. (for Chance Collar Co.)	50,833	0
Houston Lighting & Power Company	54,743	0
Hydril Company	260,304	0
ICI Americas Inc.	20,000	0
Jacob Stern & Sons, Inc.	15,000	0
Keystone/Anderson, Greenwood & Co.	20,000	0
Kraft, Inc. (successor to Dart Industries, Inc.)	208,757	0
Liquid Air Corporation	20,000	0
Marlin Valve Company, Inc.	15,000	0
Mobay Corporation	20,000	0
Monsanto Company	84,056	0
Nalco Chemical Company	103,873	0
National Steel Products Company	15,000	0

*Amount paid includes payments for both Source Control and Ground Water Operable Units.

GROUP B SETTLORS

	Amount Paid*	Due
O.K.P. Inc., f/k/a Kyanize Paints, Inc. (for Gulf States Paint)	15,000	0
Occidental Chemical Corporation	87,727	0
Oil Field Rental Service Company	15,000	0
Olshan Demolishing	500	0
Pacific Molasses Co.	500	0
Port Drum Company (for Drum Service Co., Inc.)	30,000	0
Port Terminal Railroad Association	30,000	0
Reichhold Chemicals, Inc.	30,000	0
Robinson Iron & Metal	500	0
Sequa Corporation (for Arnold & Clark and Chromalloy)	80,055	0
The Service Co. (Floss)	500	0
Shell Oil Company	406,720	0
Signor No. 5007, Inc. (formerly Mission Petroleum Carriers, Inc.)	20,000	0
South Coast Terminals, Inc.	15,000	0
T H Agriculture & Nutrition Company, Inc.	15,000	0
Texaco Inc.	71,700	0
Texas Bolt Company	20,000	0
Texas Instruments, Inc.	30,000	0
Texas Iron Works	32,110	0
The Quaker Oats Company (for Anderson Clayton)	45,402	0
Transcontinental Gas Pipe Line Corporation	30,000	0
Union Pacific Railroad Company (for Missouri Pacific Railroad Company)	30,000	0
Union Carbide Chemical and Plastics Company, Inc.	30,000	0
United Galvanizing, Inc.	34,474	0
The Upjohn Company	15,000	0
Velsicol Chemical Corporation	15,000	0
W.R. Grace & Co., Construction Products Division	30,000	0
W.T. Byler Co., Inc.	15,000	0
Warren Petroleum Company, a division of Chevron U.S.A. Inc.	73,937	0
Wyatt Industries, Inc.	15,000	0
	3,707,505	

*Amount paid includes payments for both Source Control and Ground Water Operable Units.



ERM-Southwest, inc.
NEW ORLEANS, LOUISIANA HOUSTON, TEXAS

8/1/89 WO NO 9122A020

ATTACHMENT D

SHERIDAN SITE
CONSENT DECREE